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Marine Oil Spills: Prevention Methods & Enforcement Tools

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MARINE OIL SPILLS:
PREVENTION METHODS & ENFORCEMENT TOOLS

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I. Introduction

Early in 1993 the Liberian oil tanker Braer crippled by no power and hurricane level storms drifted for several hours before grounding near the Shetland Islands in Scotland, threatening a fragile marine ecosystem.[1] With nearly 25 million gallons of crude oil as its cargo, the battered tanker suffered the terrible weather and seas.[2] As all waited for the Braer's fate to unfold, the world faced a sadly familiar question, how could such oil spills be prevented?

The British Coast Guard promptly responded to the tanker's distress calls and evacuated all but the ship's engineers who vainly attempted to repair the machinery.[3] For days the vicious storm battered the tanker, until on January 11, 1993 the Braer broke apart. Since the severe weather conditions prevented removal of the cargo, virtually

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[1] Sunken Tanker Fears Grow, Fin. Times, Jan. 6, 1993, at 1.

[2] Id.

[3] Robert Pavia & Jerry A. Galth, National Oceanic and Atmospheric Administration, Report on the Braer Oil Spill, Shetland Isles, United Kingdom (1993) [hereinafter NOAA Report].

all of the crude oil spilled when the tanker broke.[4]

Spill containment measures were taken, but proved to be of little value. On January 6, 1993, the British government released 100 metric tons of chemical dispersant into the water as a preventive measure to the anticipated oil spill.[5] Controversy over the use of the dispersant prevented any use of other dispersants.[6] Response crews deployed containment booms to collect the oil and protect the sensitive shorelines.[7] Shetlanders braced for a ecosystem disaster. Thankfully the spill dispersed more readily than anticipated due to the crude oil's chemical

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[4] Braer's Oil Dispersed by Storms, Fin. Times, Jan. 14, 1993, at 6.

[5] NOAA Report, supra note 3, at 4. Dispersant application was limited due to several controversies in the Braer spill. High winds and waves threatened to spread the chemicals onto the shore and populated areas which created more environmental harm than help. The natural dispersion of the Norwegian crude oil, the severe weather and public outcry against dispersant. Id.

[6] NOAA Report, supra note 3, at 4. The weather and high waves made it likely the dispersant could wash ashore in populated areas and fisheries. There was also confusion about the type of dispersant used. One report claimed the British spread an older brand of dispersant which had previously been banned due to its toxicity. The public concern about dispersant application, the hurricane force winds and waves, and the natural dispersion of the oil prevented any further dispersant application. Id.

[7] Hearings Before the Subcomm. on Oversight and Investigations of the House Comm. on Natural Resources, 103rd Cong., 2d Sess. (1993) [hereinafter Hearings] (testimony of Rear Admiral Arthur E. Henn).

composition and the harsh weather that had caused the spill.[8]

The Braer oil spill, like the hundreds worldwide that preceded it, illustrate the tension between mankind's thirst to consume energy and its attempts to conserve both the resources and the environment.[9] Oilis the world's most useful fuel, and the risks attendant to its use have been accepted.[10] In recent decades catastrophic oil spills captured the public's attention and forced both the United States and the international community to deal with these ecosystem disasters time and again. What preventive measures and enforcement tools developed from these domestic and international reactions? How effective are the measures and tools? These are the issues this thesis will explore.

Balancing the risks of ecosystem damage by oil spills

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[8] Id. The oil spilled by the Braer was a light crude that resists taking up water and forming emulsions. As a result of these chemical characteristics, the Shetland Islands did not suffer the tar balls and thick mousse that plaqued Alaska from the Exxon Valdez spill. Barry Hillenbrand, Resilient Sea, Time, Jan. 25, 1993, at 51.

[9] See Three Spills Make 1992 Second Worst Year for Oil Spills Worldwide Since 1983, But US Spills Continue to Decrease, Oil Spill Intelligence Report (Cutter Information Corp., Arlington, Mass.), Mar. 18, 1993 [hereinafter Intelligence Report]; Jack Doyle, Friends of the Earth, Crude Awakenings (1993) [hereinafter Crude Awakenings]; Committee on Tanker Design, National Research Council, Tanker Spills: Prevention by Design, at 28-29 (1991) [hereinafter Tanker Spills].

[10] See U.S. Coast Guard, Report to Congress, Alternatives to Double Hull Tank Vessel Design, Doc. No. , 102d Cong., 1st Sess., (1992) [hereinafter Report to Congress].

against costly preventive measures is aided by a thorough understanding of the threat oil poses to the oceans. The magnitude of the threat depends on many variables. Part II identifies and assesses those variables which include oil's chemical nature, the weathering of oil in the oceans, oil's impact on the marine ecosystem-- both its lethal and sublethal effects, limitations of oil spill studies, and the potential for future marine oil spills to occur. The magnitude of oil spill threats is used to decide whether to require costly prevention measures.

Part III examines how international marine pollution law developed to address the threat. Who has the power to control a vessel's polluting activities is of great concern in this area. Part III describes the historical growth in the power of coastal, port and marine states to control vessel pollution. The evolution of international marine pollution laws from liability and compensation schemes to substantive preventative measures is also discussed.

Part IV traces the molding of U.S. oil spill laws until the passage of the Oil Pollution Act of 1990 (OPA).[11] Part V examines the OPA, particularly the preventative measures the Act created. The remainder of this paper examines the current status of international marine pollution law. The growth of jurisdictional law, prevention

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[11] Oil Pollution Act of 1990 (OPA), Pub. L. No. 101-380, 104 Stat. 484 (1990), codified at 33 U.S.C. §§2701-2761 (West 1992).

control laws, and enforcement measures will be discussed in Part VI. Part VII contains an overall assessment of oil spill prevention tools put in the context of the Braer spill.

II. Oil's Threat to the Oceans

To better assess marine pollution law's response to oil spills, one must understand the threats oil spills pose to the ocean. Review of the specific chemical composition and the weathering[12] of oil will assist in assessing an oil spill's environmental threat.[13] The studies of oil spills detail ecosystem impacts, but have limitations that should be understood before assessing the legal and policy approaches to oil spill prevention.

A. Chemical Composition

Oils are complex mixtures comprised primarily of hydrocarbons, oxygen and sulfur.[14] There are two general

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[12] Weathering of oil refers to the chemical and physical changes oil undergoes over time in the ocean. Robert W. Howarth & Roxanne Marino, Greenpeace, Oil in the Oceans 9-16 (1991) [hereinafter Oil in the Oceans]. This study is based primarily on the National Acad. of Sci., Oil in the Sea: Inputs, Fates, and Effects, (1985) [hereinafter NAS]. Mr. Howarth was a workshop participant in the study's compilation and contributed a background paper on oil's impact on the marine ecosystems. See NAS at iv.

[13] The Braer spill illustrates this point well. The relatively light oil it carried tended to evaporate and disperse naturally with the rough winds and waves assisting. Hearings, supra note 8, (testimony of Rear Admiral Arthur E. Henn); NOAA Report, supra note 3, at 3.

[14] NAS, supra note 12.

classes of hydrocarbons, aliphatic and aromatic, each of which have unique chemical characteristics.[15] The aliphatic hydrocarbons exist in straight chains or rings, and are generally considered not to be hazardous in marine environments except for the physical smothering of intertidal animals or coating of birds' feathers.[16] Aromatic hydrocarbons, however, form closed rings called benzene rings, that are toxic to human health and environment.[17] Many aromatic hydrocarbons are carcinogenic.[18] One class of aromatic hydrocarbons, called polynuclear aromatic hydrocarbons (PAHs) are highly toxic and carcinogenic.[19] Little is known about the potential toxicity of the sulfur- and oxygen-containing

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[15] Id. at 18-26. Aliphatic hydrocarbons are those compounds of hydrogen and oxygen atoms bonded together in straight chains, rather than in rings as the aromatic hydrocarbons are. The way the atoms bond together to form a chemical compound such as hydrocarbons affect the chemical nature of the compound, and for purposes of this analysis the compound's toxicity. Id.

[16] Id. at 431-432.

[17] Id. at 18-26. Aromatic hydrocarbons include compounds such as benzene, toluene, phenanthrene, naphthalene, and benz-pyrene. Aromatic hydrocarbons may be distinguished by the size of the molecule into low- and high- molecular weight aromatics. The low-molecular weight aromatics are particularly soluble in water, unlike most hydrocarbons which are not. Benzene, which makes up about 6% by weight of oil, is the most soluble of the aromatics, and the most toxic to the marine environment. Id.

[18] Id. at 293-294, 315-316, 472-491.

[19] Id. at 315-316.

components of oil in the marine environment, but they are regarded as relatively toxic compounds nonetheless.[20]

Oils are divided into various classes: crude and refined oils. "Crude oils" refer to the natural state of oils as they emerge from the earth. Crude oils, named for their place of origin, exhibit characteristics unique to their specific chemical composition.[21] Crude oil is refined through distillation and chemical processes. The chemical composition of refined oil consists of many compounds found in crude oil and chemically similar compounds created during the refining process.[22] Refined oils include gasoline, kerosene, diesel fuel, tar and asphalt. The aromatic content of refined oils varies from 20 to 38% of the total weight.[23] Refined oils also vary

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[20] Id. at 472-491.

[21] Id. at 17-23. Crude oils are created over millions of years from dead biological materials by the high temperatures and pressures within the earth's crust. The substance (crude oil) formed by these conditions is distinct from its original biological building blocks. Despite crude oil's natural development, it still is harmful to the marine environment. The toxicity is a function of the aromatic hydrocarbon concentration within crude oil. Id. The specific compositions of various crude oils varies with the geological conditions under which the crude oil was formed. For example, Prudhoe Bay crude oil contains approximately 25% aromatics by weight and is fairly toxic. Whereas, Louisiana crude oil contains 16.5% aromatics by weight, and is correspondingly less toxic. Oil in the Oceans, supra note 12, at 2.

[22] See NAS, supra note 12, at 23-25.

[23] Oil in the Oceans, supra note 12, at 2.

in volatility[24] and viscosity[25] which affect refined oils' behavior in the marine environment.[26]

B. Weathering of Oil

When petroleum products are introduced into marine ecosystems a number of physical, chemical, and microbiological processes act on the oil.[27] Over time oil "weathers," meaning it changes its composition, form, or volume. The winds, temperature, sunshine, and wave actions affect the dispersion, dissipation, evaporation, and eventual impact of the oil spill.[28] Oil can create slicks atop the water, strand upon the shoreline, evaporate, disperse or dissolve into the water, sink to the bottom sediments, break down into more soluble substances, or form the tarballs that beachcombers hate.[29]

Many oil components are insoluble in and lighter than water, thus forming a slick atop the water's surface. The thickness and persistence of the slick depend on the water

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[24] See NAS, supra note 12, at 276-277. Volatility refers to a substance's property of being freely or rapidly evaporating at normal temperatures into the atmosphere. Id.

[25] Id. at 272. Viscosity is the state, quality or property of a substance to be glutinous, semifluid or sticky. Id.

[26] Id. at 271-282.

[27] Id. at 270.

[28] Id. at 375-379.

[29] Id. at 270-280.

temperature and the viscosity of the oil.[30] Studies show slicks generally dissipate over a period of days to many months.[31] Over time slicks develop into clumps of gel-like oil, resembling mousse.[32] The oil can also weather into tar balls.[33] If the oil spill occurs near the shoreline, oil can wash onto sand, sediments, vegetation, and rocks. Stranded oil can sink into the sands, beaches, sediments of salt marshes, mangrove swamps and mud flats.[34] The stranded oil may persist for months in a "high energy" shoreline or for years in a "low energy" shoreline.[35] This oil may have weathered somewhat during its journey to the coastline, but it still may contain high

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[30] Id. More viscous spills spread less and remain thick. Less viscous spills or warmer temperatures thin oil. The longer the slick remains on the water, the less viscous it becomes. The thinner the slick, the more wave and wind action can break up the slick. Id.

[31] Id. at 273-281.

[32] Id. at 10.

[33] See James E. Mielke, Congressional Research Service, Oil in the Ocean: The Short- and Long- Term Impacts of a Spill, (1990) [hereinafter Mielke, Impacts of a Spill].

[34] Id. at 5-6, 12-13.

[35] Id. "High energy" shorelines are those which are exposed to high wave activity, thereby, removing oil fairly quickly. "Low energy" shorelines experience little wave activity, leaving stranded oil on the coastline, sometimes for extended periods of time. Oil stranded on the Brittany beaches following the 1978 Amoco Cadiz spill persisted for at least 3 years. Oil spilled on the Straits of Magellan in 1974 is thought to persist for 15 to 30 years later. A small oil spill affecting a Cape Cod salt marsh persisted 20 years later, even though most of it decomposed. NAS, supra note 12, at 15. See also Oil in the Oceans, supra note 13, at 31-34.

levels of toxic components posing some risks to the ecosystem.[36]

Oil may also be lost to evaporation in a spill. The average loss to evaporation is 25% of a given slick.[37] The evaporative process is most pronounced during the initial days following the spill. Studies assume the potential environmental impacts from evaporation of spilled oil are minimal.[38] However, evaporation rates in marine environments are difficult to determine. Evaporation leaves the less volatile components of the oil to form the mousse described earlier. The formation of mousse may prolong the impact of the spill and increase the risks to birds and marine mammals which may come in contact with the spill.[39]

Oil spills eventually disperse into the waters or sink to the bottom or evaporate to the air.[40] Dispersion of oil into the water column is one of the major processes of breaking up an oil slick. The oil breaks into small droplets increasing the surface area, and possibly speeding

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[36] NAS, supra note 12, at 15.

[37] Id. at 267-277. While studies show the average evaporation of a spill is 25%, in some spills as much as two-thirds of the oil mass may evaporate. See Mielke, Impacts of a Spill, supra note 33, at 11.

[38] Oil in the Oceans, supra note 12, at 20-34.

[39] NAS, supra note 12, at 304.

[40] Mielke, Impacts of a Spill, supra note 33, at 10-14.

the dissolution of the oil.[41] Little scientific study has been made of this process.[42] Observations show the fiercer the waves and winds, the greater the dispersion.[43] The time oil remains dispersed in the water is unknown, but it is probably relatively short.[44]

The dissolution process involves the most toxic hydrocarbons. As noted previously, simple aromatic hydrocarbons are both very soluble in water and extremely toxic. The National Academy of Science in its comprehensive study of marine oil pollution states: "It should be re-emphasized that ... the simplest aromatic compounds ... are among the most toxic compounds of crude and refined oil, and as they are also the most soluble, their impact on the marine environment is greater than the simple mass balance considerations would imply."[45] Measurement of dissolved oil hydrocarbons is extremely difficult and inaccurate.[46] Very few studies analyze the persistance of dissolved

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[41] Id.

[42] NAS, supra note 12, at 277-279. Little is known of the time oil remains dispersed in water. Eventually the oil either dissolves or drops into the sediment. Id.

[43] Id.

[44] Id.

[45] Id. at 278.

[46] Id. at 277.

oil.[47] What is known is that low concentrations of dissolved aromatic hydrocarbons present dangers to marine ecosystems.[48]

As oil spills dissipate, evaporate, and dissolve, some oil settles in the sea's sediment via various processes.[49] Hydrocarbons in the sediment may persist for long periods of time, depending on whether the hydrocarbons are aromatic or aliphatic.[50]. Components of the oil spill left after dissolution and evaporation are generally the higher molecular weight compounds. These hydrocarbons eventually

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[47] Id. Concentrations in seawater are measured in micrograms per liter or parts per billion (ppb). The concentration of dissolved hydrocarbons immediately following an oil spill average between 100 and 300 ppb. These concentrations decrease rapidly, but do not disappear. Chronic seepage or spills of oil cause an elevated baseline concentration to persist. In catastrophic oil spills, initial concentration peak then may decrease, but the low concentrations found long after the spill still present health and environmental dangers. Id. at 483-490.

[48] Id.

[49] Id. at 284-286. One such process occurs when zooplankton feed on the oil droplets, mistakenly taking them for food. The oil passes through the tiny invertebrates, and is excreted with fecal matter which sink to the sea bottom. Phytoplankton also ingest the oil droplets and sink to the bottom with their undigestible load. Id. at 290.

[50] Id. at 305. Aromatic hydrocarbons in oxygen free sedimentation persist for at least 12 years, if not longer. If oxygen is present, microorganisms work to decompose the hydrocarbons. Since oxygen is present only in the top 1 mm of sediment, when sediment is added from coastal runoff atop contaminated sediment oxygen does not reach the contaminated sediment. Oil hydrocarbons may persist for long periods in such conditions. Id.

become tar balls.[51] These may linger in the seas or wash up on the shores.

C. Ecosystem Impacts

The impact of oil on marine organisms and the ocean's ecosystem depends on many variables.[52] Scientific studies present evidence of the lethal and sublethal effects of marine oil spills. Despite the limitations of these studies, they show the need for spill prevention measures. How quickly and extensively the spill prevention measures should be made depends not only on the spill's impact, but also depends on the probability for spills to occur and the costs of the measures.

1. Lethal Effects of Oil

Studies divide marine oil spill impacts into lethal and sublethal effects. The lethal effects are caused by the highly toxic and carcinogenic components of oil,

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[51] Id. at 322-325. Tar balls are often seen in the tanker lanes of the oceans. They range in size from 1 mm to many centimeters. Tar balls are thought to evolve from 10 to 30% of the oil hydrocarbons introduced via various means to the oceans. Since little data exists for two-thirds of the world's oceans, the number of tarballs in the oceans is unknown. Id.

[52] Id. at 368. The variables include chemical composition of the oil spilled, how the oil is introduced into the ocean, the weather, the temperature, the weathering effects, and to some extent, which interpretation of scientific studies one believes. See Tanker Spills, supra note 9, at 155.

particularly polyaromatic hydrocarbons (PAH)[53], aromatic hydrocarbons and those hydrocarbons containing sulfur, nitrogen, and oxygen components.[54] High exposure to such hydrocarbons may be immediately lethal to marine creatures.[55] Birds and marine mammals are most vulnerable to the lethal effects of oil spills.[56] Birds rely on their feathers to repel water and to insulate them from the cold. Once feathers are oiled, they lose their water repellency and insulation capabilities leaving the birds vulnerable to hypothermia.[57] This is a physical phenomenon not related to the oil's toxicity, but it nonetheless causes tremendous losses.[58] Birds die from

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[53] Polynuclear aromatic hydrocarbons (PAH) are aromatic hydrocarbons with a particular chemical composition (containing more than one *benzene ring*). PAHs are particularly toxic and carcinogenic substances. NAS, supra note 12, at 383, 395.

[54] Id.

[55] Id. at 369-472.

[56] Id. at 431-432.

[57] Id. The bird expends more energy to keep warm once the feathers lose their repellency and insulation capabilities. Its metabolism rate increases, expending great energy to keep the bird warm. The increased metabolism fails to correct the insulation problem, leaving the bird to sink and drown or die of hypothermia. Id.

[58] Id. The Exxon Valdez spill killed more than 33,000 birds- this is deemed to be a very low figure of the real casualties since many dead birds are killed by scavengers, sink before sighted, drift or decompose before a count is made. Scientists estimate between 100,000 and 300,000 birds died as a result of the Valdez spill. Even small spills prove lethal to birds- over 30,000 birds died in January, 1981 due (continued...)

the toxicity of oil either by inhaling it, ingesting it with food or from their feathers during grooming. Such ingestion of oil can lead to kidney or heart failure, or sublethal biological effects.[59]

Other animals die from oil spills, but the lethal effects are not well documented.[60] Seals, otters, and polar bears may face the same dangers as do birds from oil on their insulating coats.[61] Fish, invertebrate organisms, and plants may be immediately killed by oil spills.[62] Many of the invertebrates vulnerable to oil pollution serve in the food chain for other organisms, but the extent of invertebrates' vulnerability is unknown.[63]

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[58](...continued)
to a spill of Skaggerrak, Denmark. Oil in the Oceans, supra note 12, at 16-34.

[59] NAS, supra note 12, at 431.

[60] Id. at 430. Mortality of the marine mammals, for instance, is difficult to tie to oil spills due to a lack of studies on the toxological effects of oil on such mammals. Id.

[61] Id. at 424-430.

[62] Id. at 383-448.

[63] Id. at 401-416. Large immediate kills have rarely been observed, but this may be due to differences in the oil's behavior, the organism's sensitivities, and the speed and skill of those scientists who try to identify the invertebrates effected. The latter factor arises because dead organisms disappear quickly in nature, or are extremely difficult to see. For example, young fish larvae are more vulnerable to oil's toxicity than adult fish, but these losses may be easy to miss since they are more difficult to observe. Id.

2. Sublethal Effects of Oil

Sublethal effects are seen from exposures to the hydrocarbons at concentrations below those necessary for lethality. These lower exposures may affect creatures' ability to grow and reproduce, their behavior, and lead to bioaccumulation of toxins within their tissues.[64] The sublethal effects vary greatly with each species and spill. Oil can greatly reduce the growth rate of fish, shellfish, and bottom dwelling organisms due to oil-contaminated sedimentation.[65] Genetic damage to animals may occur from the oil pollution. Abnormal tumors or growths may appear on invertebrates months after exposure to high concentrations of oil.[66] Many marine plants and animals experience reproductive problems from sublethal oil effects.[67]1 Sublethal doses of oil may create behavior changes in many

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[64] Id. Such bioaccumulation effects organisms higher in the food chain.

[65] Id. at 412.

[66] Id. at 383-385.

[67] Id. at 392-394. For example, ingestion of oil by birds and marine turtles increase the probability of developmental abnormalities in the offspring, and affect the viability of the eggs. Fresh oil appears to be more toxic than weathered oil to incubating marine turtles. Low concentrations of oil have lead to these problems. Id. See also Oil in the Oceans, supra note 12, at 32-33.

marine animals.[68] Low concentrations of oil can also effect ecosystems by reducing the feeding rates of benthic and planktonic animals.[69]

Ecosystem impact must be considered in order to weigh marine oil pollution risks against the costs of prevention. The studies of the benthic communities best document and analyze the effects of an oil spill.[70] High concentrations of oil in fine-grained sediments cause massive kills of benthic communities.[71] At very low levels of oil contamination, oil-sensitive species are replaced with oil-tolerant species.[72] The total number of species generally decreases with oil contamination. Because oil is persistent in fine-grained sediment, it impacts bottom dwelling organisms for a long time.[73]

Coastal wetlands and seagrass beds are often victims of

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[68] NAS, supra note 12, at 415-417. Marine turtles whose nesting areas were soiled with oil can lose the ability to return to their nesting grounds. Salmon act as though hydrocarbons drug them, producing problems with migration and spawning processes. Bald eagles were observed to abandon their nests uncharacteristically in the wake of the Exxon Valdez spill. Oil in the Oceans, supra note 12, at 20.

[69] Tanker Spills, supra note 9, at 158.

[70] Oil in the Oceans, supra note 13, at 22. Benthic communities are those plant or animals living on the sea bottom. Id.

[71] Id. at 22.

[72] Id. Examples of the more sensitive species are amphipods and ostracods. The oil tolerant species include polychaete worms and nematode worms. Id.

[73] Id.; Tanker Spills, supra note 9, at 155.

oil spills. Oil slicks kill the grasses and mangrove trees quickly.[74] If the oiling penetrates deeply into the sediment, regrowth of these plants may take years.[75] Mangroves are very sensitive to oiling due to their hollow root structure, and may not survive an oil spill.[76] Wetlands and seagrass marshes tend to have fine-grained sediments in which oil contamination persists. Animal life in such wetlands, seagrass marshes, and mangrove swamps may be significantly affected by the long-lasting oil contamination.[77] Rocky and hard bottom benthic and littoral communities vary in their reaction to oil contamination. High concentration of oil hydrocarbons can kill various animals living in rocky areas.[78] Lower concentrations reduce the number of oil sensitive species and replace them with more tolerant ones.[79] Some times the affected population rebounds in several weeks, other times it takes a year. When organisms at the bottom of the

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[74] Oil in the Oceans, supra note 13, at 25.

[75] Id.

[76] Id. Mangroves have hollow roots which spread along the soil's surface. Oxygen transfers occur in these roots to keep the mangroves alive. Oiling interferes with that transfer, resulting in the tree's death. Once the mangroves roots are damaged, regeneration of the roots is very slow. Id.

[77] Id. at 25-27. Populations of animals relying on the coastal wetlands, marshes, and swamps will most likely declines in number and species type. Id.

[78] Id.

[79] Id. at 19-34.

food chain like macroalgae are severely damaged, recovery can take a decade or more.[80] Studies have not yet explained the reasons for these contrasting impacts.[81]

Coral reefs are one of the world's richest ecosystems. They appear to have suffered tremendous damage due to oil spills, yet few studies have carefully studied the oil's impact.[82] Those studies that have examined oil's effects on coral show various sublethal impact. The sublethal effects on coral ecosystems include decreased reproduction, lower growth rates, and disruption of feeding habits.[83] Some strains of coral prove to be oil-resistant.[84] A 1986 oil spill in Panama provided the best study available of oil's impacts on coral.[85] The spill caused extensive damage to the reefs. One commentator opines it can take 200 years for fragile coral reefs to recover from long-term oil spill damage.[86] The extreme damage to the coral ecosystem was much more severe than had been predicted from the few

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[80] Id.

[81] Id. at 26.

[82] Id.

[83] Id.

[84] Id. at 27.

[85] J.B.C. Jackson, J.D. Cubit, et al., Ecological Effects of a Major Oil Spill on Panamanian Coastal Marine Communities, 243 Science 37-44 (1989).

[86] Nina Sankovitch, Natural Resources Defense Council, Safety at Bay, 11 (1992) [hereinafter Safety at Bay].

studies available.[87]

Other important ocean dwellers to consider are the phytoplankton. Phytoplankton serve as the bottom of the marine food chain and renew 70% of the world's oxygen by biological actions.[88] Phytoplankton live in the top layer of the ocean and face destruction by oil slicks.[89] Since phytoplankton reproduce quickly, scientists have long viewed oil pollution posed little risk to planktonic ecosystems.[90] These assumptions are based upon the belief that oil hydrocarbons do not persist in the water column for enough time to affect these tiny microorganisms. Frequently, this assumption is false. Toxic components of oil may dissolve into the water column and persist for many months.[91] Studies show low concentrations of dissolved hydrocarbons can alter the community composition of a species like phytoplankton; oil tolerant species replace the oil sensitive ones.[92] The limitations of existing studies prevent a more thorough understanding of oil spill's effects.

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[87] Oil in the Oceans, supra note 13, at 27.

[88] R. Hallman, Rep. of the Int'l Inst. for Environment & Dev. Towards an Environmentally Sound Law of the Sea, 2 (1974).

[89] Tanker Spills, supra note 9, at 156.

[90] Id.

[91] Oil in the Oceans, supra note 13, at 27.

[92] Id.

3 . Limitations of Studies

The ocean covers most of the earth's surface, and has provided states with water, food, livelihoods, and fortunes.[93] Yet through all the centuries of use, man has not closely studied the ocean. Only in recent years have catastrophic oil spills and the like spurred studies of man's effect on the marine environment. Since a study's conclusion is only as valid as the study itself, the marine oil spill studies reviewed above merit scrutiny.

Some scientists view studies of oil's toxicity to be poorly done for a variety of reasons.[94] Only a fraction

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[93] Middle eastern countries rely on desalinated ocean water for potable drinking water. Wood, The Changing Face of Desalination- A Consulting Engineer's Viewpoint, 42 Desalination 17, 18 (1982). The worldwide commercial catch of fish reached 84.5 million tons in 1987, providing protein for over two billion people. Nicholas Lenssen, The Ocean Blues, in The World-Watch Reader on Global Environmental Issues, 43-59 (Lester R. Brown et al. eds., 1991). Salt mined from the seas preserved food and balanced people's health. See J. Mero, The Mineral Resources of the Sea, 25-27 (2d ed. 1965).

[94] See Oil in the Oceans, supra note 13, at 1-34. Another criticism of the toxicity studies relates to one of the methodologies used- the lethal concentration-50 approach (called the LC 50). The LC 50 is the concentration of a substance which causes mortality of 50% of the organisms studied over a period of time, generally, not longer than 96 hours after the oil is introduced to the water. This test ignores the effects of oil short of death, and any effects of oil past 96 hours. This method tends to use organisms which are naturally pollution tolerant, giving the test little relevance for more sensitive organisms which inhabit the kinds of ecosystems studied. When sensitive organisms have been used, the control group which is not exposed to oil has a high mortality rate naturally, making the study's comparison data

(continued...)

of past spills have been studied for the impact.[95] Artificially generated spills frequently serve as the more common method of studying marine oil pollution, but these too are relatively few and cannot accurately replicate marine life and processes.[96] Most studies focus on the short term effects of oil spills, providing little insight into the long term effects.[97] In the instance of phytoplankton, the lack of pre-spill data and paucity of studies of actual spills hamper a true understanding of

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[94](...continued)
fairly inaccurate. The LC 50 methodology only measures the amount of oil added to the water, not the concentration of oil in the water. Since oil will evaporate, cling to the test container's surface, and will degrade naturally to its components, the actual concentration of oil the organisms face is underestimated. This underestimation of oil concentration results in an underestimation of oil's toxicity in natural settings. Id. at 18.

[95] According to Thomas Howath, in the Oil in the Oceans study, supra note 13, "the majority of oil spills are quite poorly studied, including many large spills and even those receiving a great deal of public attention." Id. at 22. The reasons he cites are many: oil spills occur without warning, giving scientists little time to obtain either funding or supplies or personnel to study the effects; poor weather generally contributes to the disaster's occurrence and hampers sampling; the spills often occur in areas which have little prior ecological study from which to draw comparisons or conclusions; biological processes within the oceans are poorly understood and variable in populations making post-spill assessments of damage nearly impossible to assess. Id.; see also Tanker Spills, supra note 10, at 153-156.

[96] Oil in the Oceans, supra note 13, at 20-25. Some view the artificial experiments as better study tools since they allow for comparisons of the subject ecosystem before and after the oil spill. Id. at 22.

[97] Id.; see also Tanker Spills, supra note 9, at 153-160.

chronic oil exposure.[98] Some commentators and scientists fear the short term studies and solutions may be misleading.[99] These experts note that ecosystems assimilate pollution and toxins with no apparent effect until without much warning the ecosystem collapses.[100]

Still other commentators point to the phenomenon of natural seepage of oil within the oceans to dispute fears of ecosystem collapse.[101] James E. Mielke, a specialist in Marine and Earth Sciences of the Congressional Research Service in his report to Congress on July 24, 1990[102] on oil's impact on the oceans concluded though catastrophic spills are admittedly destructive, they were basically only so in the short term. Mr. Mielke reports "oil is a natural substance and ... natural processes, over time, will do much to remove it."[103] His conclusions imply since oil is naturally spilled within the oceans with no apparent ecosystem problems, the impacts over time are not as disastrous as media coverage would suggest.[104] Natural

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[98] Oil in the Oceans, supra note 13, at 27-28.

[99] See John Warren Kindt, Marine Pollution and the Law of the Sea, 3-42 (1986); Oil in the Seas, supra note 12, at 38-40.

[100] Kindt, supra note 99.

[101] See Mielke, Impacts of a Spill, supra note 33.

[102] Id.

[103] Id. at i.

[104] Id. at 32-34.

oil seeps occur throughout the world. Yet very few studies assess the ecological impact of these seeps.[105] The few studies available indicate the effects of oil are less than one would extrapolate from oil spill studies.[106] Various theories attempt to answer this: perhaps the toxicity of oil entering the ocean through natural seeps is very low,[107] or the animals living in the natural seeps areas evolved to become more oil resistant.[108] Nonetheless, effects of oil on areas subject to centuries of natural seeps seems to have questionable relevance in predicting the effects of oil spills on unadapted organisms in pristine areas.[109]

Mr. Mielke uses as support for his interpretations a primer in the field of marine oil pollution - the National Academy of Science's 1985 study.[110] Interestingly enough, that same primer serves as the basis for other scientific interpretations of marine oil pollution which differ sharply in their assessment of the ecological dangers

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[105] Id.

[106] Oil in the Oceans, supra note 12, at 25.

[107] Id. There is little evidence to support this theory. Id.

[108] Id. The best evidence currently does not support the evolutionary theory either. Id.

[109] Id.

[110] NAS, supra note 12.

oil spills cause.[111] The National Academy of Sciences (NAS) performed another study in 1991 assessing tanker designs and prevention measures.[112] In that study, NAS clearly recognized the paucity of research on long-term effects of oil spills, but, nonetheless, found extensive long-term ecosystem damages from spills.[113] Both the international community and the United States recognize the limited understanding of marine oil spills and have directed further studies be made.

D. Potential for Spills

Existing studies provide some insight as to the dangers of oil spills. The potential for such spills, however, is linked to factors like the frequency and amount of oil transported, and the number, age, and design of the tankers. Review of these factors prove tanker spills are likely to continue absent effective preventive measures.

Oil remains the major energy source of the world.[114] The use of this oil requires oceanic transport. Over 1.5 billion metric tons of oil and oil products cross the seas

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[111] See Kindt, supra note 99; Oil in the Oceans, supra note 12; Safety at Bay, supra note 86; Crude Awakenings, supra note 9; Tanker Spills, supra note 9, at 153-160.

[112] Tanker Spills, supra note 9.

[113] NAS, supra note 12, at 156; Tanker Design, supra note 9, at 155.

[114] Tanker Design, supra note 9, at 153-159.

yearly.[115] Nearly one-third of this total passes through U.S. waters.[116] The United States alone receives more than 8 million barrels of crude oil, gasoline, and other petroleum products daily from tankers.[117] Projections claim U.S. petroleum imports will increase by 50% by the year 2000.[118] Approximately 80% of the oil transported is crude oil, with the remainder being refined or petroleum products.[119] As the amount of oil transported has grown, so has the size and age of the tanker fleet.

During the 1970s, the size and total tonnage of the tankers increased significantly.[120] In 1971, the tanker fleet was closely divided between vessels greater than 65,000 dead weight ton (dwt) and those less than 65,000 dwt.[121] Less than ten years later, only 16.9% of the oil tankers were less than 65,000 dwt.[122] From 1981 to 1986, a growing percentage of the world's tanker fleet were of the

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[115] Id. at 11.

[116] Id.

[117] Crude Awakening, supra note 9, at 115.

[118] Tanker Spills, supra note 9, at 1.

[119] Tanker Spills, supra note 9, at 10-15.

[120] Oil in the Oceans, supra note 12, at 3.

[121] Id. 44% of the ships were less than 65,000 dwt and 56% of ships were greater than 65,000 dwt. Id.

[122] Id.

200,000 - 320,000 dwt range.[123] By 1996, 62% of this world fleet, including many of the largest oil tankers, will be 15 years or older[124] and 27% will be 25 years or older.[125] The aging of the world's tanker fleet increases risks of spill.[126] Vessel strength and construction weakens over time from the voyages and structural fatigue.[127] Given the nonstop oil flow tankers deliver, experts place the lifespan of supertankers at a maximum of 20 years.[128]

From 1978 to 1992, the number of oil spills significantly increased, though the amounts spilled

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[123] Oil in the Oceans, supra note 12, at 3.

[124] International Salvage Industry Survey, April 1992, as quoted in Testimony of the Natural Resources Defense Council, before the House Subcommittee on Oversight and Investigations of the Committee on Natural Resources. February 4, 1993.

[125] Id.

[126] Tanker Spills, supra note 9, at 33-34; Safety at Bay, supra note 86, at 2.

[127] See Tanker Spills, supra note 9, at 79-98.

[128] Crude Awakening, supra note 9, at 9-12. Time is money, especially in the world of petroleum shipment. Keeping the tankers afloat as long as possible with as little capital and maintenance investment as possible to continue profitable shipments of oil are the tanker and oil industries' goals. These goals override concerns of the dangers of an aging tanker fleet sailing the seas, despite studies that find older tankers risk oil spill accidents at a significantly higher rate. Tankers which are 15 years old are three times for likely to have structural failure than tankers one-third that age. Id. at 9-10, 115-116.

fluctuated for that same period.[129] In 1992, 138.7 million gallons of oil was reported to have spilled worldwide, as compared to 282.6 million gallons spilled in 1991.[130] In 1979, nearly 336 million gallons were reported spilled.[131] Massive spills seemed to decrease in the 1980s, only to face a trend of smaller more frequent catastrophic spills in the 1990s. Small spills (between 10,000 and 100,000 gallons) make up the largest number of spills.[132] The number of spills worldwide of medium size (between 100,000 gallons and 1 million gallons), large (spills between 1 million and 10 million gallons), and mega spills (over 10 million gallons) appear to have been constant year to year.[133]

By contrast to the seemingly constant spillage worldwide, oil spills in the United States have decreased in volume since the Exxon Valdez disaster.[134] In 1989, 24.6 million gallons spilled in U.S. incidents; in 1991, 12 million gallons spilled; in 1992, 5.9 million gallons

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[129] Intelligence Report, supra note 9, at 1-36.

[130] Id.

[131] Id.

[132] Id.

[133] Id. Medium spills increased from 27 in 1991 to 29 in 1992. Large spills increased from three to five and mega spills grew from two to three from 1991 to 1992. Id. at 1.

[134] Id.

spilled.[135] Despite the reduction in size of spills within the U.S. waters, the numbers of incidents is increasing.[136] This may be attributed to more accurate reporting of incidents following the Valdez spill. It may also be due to the prevention measures required by the Oil Pollution Act of 1990.[137] International prevention measures took many decades of varied approaches to oil pollution to evolve. The history of international marine oil pollution laws demonstrates man's reluctance to impinge on the freedom of the seas to prevent oil spills by requiring preventive measures. That reluctance arises either from maritime states eager to protect free commerce on the oceans, or from the power of international oil companies as some critics suggest.[138]

III. History of International Marine Pollution Laws

Early international law governing the oceans affirmed the oceans were global commons for navigation and exploitation. "In 1580, Elizabeth I in retort to Spanish demands said: The use of the sea and air is common to all; neither can any title to the ocean belong to any people or private man, forasmuch as neither nature nor regard of the

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[135] Id.

[136] Id.

[137] 33 U.S.C. §§ 2701-2761.

[138] See Crude Awakenings, supra note 9.

public use permitteth any possession thereof."[139] As maritime empires grew, armed conflict was used to control the oceans. Coastal states fought to protect and secure their shores, while maritime trading states fought to preserve the freedom of the high seas.

Over several centuries rules of marine jurisdiction became accepted, whereby states claim control over particular vessels in certain waters. These marine jurisdiction laws play significant roles in understanding and implementing marine pollution laws. The pollution laws, remedies, and prevention measures applicable depend on which country (or countries) has jurisdiction over the offending vessel, or the injured waters. As will be seen, freedom of navigation governed the international approach to jurisdiction as well as marine pollution laws although the jurisdictional claims of coastal states have expanded in recent years.

Marine pollution laws first established only liability and compensation schemes without any prevention measures. As will be discussed, such methods minimized commerce restrictions and were palatable to the shipping industry. Ineffectual clean up methods and the inability of liability schemes to correct the damage caused to the ocean finally forced the international community by require preventive

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[139] See Comment, Territorial Seas- 3000 Year Old Question, 36 J. Air L. & Com. 73, 78 (1970).

measures. The evolution of marine jurisdictional and pollution laws show how difficult it has been to wake the world to the need for enforceable prevention measures.

A. Jurisdictional Powers

Jurisdiction over offenses committed off a state's coast grew with coastal state's ability to control activities off the coast. The "cannon shot rule" came into acceptance by the late 17th century.[140] This evolved into the three-mile territorial sea limit now generally accepted as the definition of a nation's territorial sea.[141] The territorial sea jurisdiction confers upon coastal nations the right to establish defense and security zones, to perform police, customs and revenue functions, and to create fishing rights.[142] States sought to extend jurisdictional reach and succeeded with concepts of the contiguous sea and

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[140] The "cannon shot" rule allegedly comes from the concept that a coastal state's jurisdiction reaches only as far as the state can defend its territory. Cannon balls realistically could not reach three miles from the coastline in the 17th century, but nonetheless the three-mile territorial sea range was adopted and historically supported by this idealistic rule. William O. Douglas, Environmental Problems of the Oceans: The Need for International Controls, 149 Env. L. 149, 157 (1971).

[141] Id.

[142] Daniel Bodansky, Protecting the Marine Environment from Vessel-Source Pollution: UNCLOS III and Beyond, 18 Ecology L.Q. 719, 748 (1991).

the exclusive economic zone (EEZ).[143] The contiguous sea extends 12 miles from the baseline from which the breadth of the territorial sea is measured.[144] The EEZ extends beyond the territorial sea's baseline out 200 nautical miles.[145] Jurisdiction over vessels beyond these zones rested with the state under whose flag the vessels sailed.[146] Throughout this expansion of maritime jurisdiction, the right of "innocent passage" through territorial seas still protected maritime states from extensive control by coastal states.

B. International Pollution Control Laws

International pollution control laws developed separately from jurisdictional laws. Before oil's reign as energy king, there was no perceived need for pollution controls. Once perceived, early attempts at global

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[143] Id. at 744-759, UNCLOS III, art. 56(1)(b)(iii), 21 I.L.M. at 1280 (coastal zone jurisdiction to protect and preserve marine environment); art. 57, 21 I.L.M. at 1280 (breadth of EEZ).

[144] This extension of jurisdictional power came with the U.N. Convention on the Territorial Sea and the Contiguous Zone, April 25, 1958 which became effective September 10, 1964. The jurisdiction discussed for territorial seas was extended to the contiguous zone. See Douglas, supra note 139, at 158.

[145] Bodansky, supra note 142, at 738.

[146] Cunnard S.S. Co. v. Mellon, 262 U.S. 100, 123 (1923); Convention on the High Seas, April 29, 1958, 13 U.S.T. 2312, 450 U.N.T.S. 82 (entered into force September 30, 1962), art. 6(1), 13 U.S.T. at 1235, 450 U.N.T.S. at 86.

pollution controls proved futile and useless. International liability and compensation conventions developed as the first solution to oil spills. Private tanker and oil industries supplemented these international conventions with private agreements promising funds for specific damages from spills. These private agreements provided another pocket for injured parties to reach, but did little to prevent spills. By using liability schemes, the world avoided costly capital investments in prevention measures, until the oil spills grew too large and too numerous to ignore.

Public outcry over huge tanker spills pushed governments to negotiate pollution prevention conventions. MARPOL 73/78 evolved from these efforts.[147] MARPOL 73/78 requires a variety of preventive design, construction and maintenance measures which will be described below. These substantive prevention measures could only be enforced by the state having jurisdiction over the vessel, which has resulted in sketchy enforcement of prevention measures.

1. Early Attempts

Vessels sailed free from marine pollution control for

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[147] International Convention for the Prevention of Pollution from Ships, opened for signature Nov. 2. 1973, 12 I.L.M. 1319 [hereinafter MARPOL]; MARPOL never entered into force, but it was incorporated with some changes into the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships, Feb. 17, 1978, 17 I.L.M. 546 (entered into force Oct 2, 1983) (amended Sept. 7, 1984, Dec. 5, 1985, Dec. 1, 1987, Mar. 1989, Oct. 1989, Mar. 1990, Mar. 1992) [hereinafter MARPOL 73/78].

centuries. In 1926, an international conference hosted by the United States discussed oil pollution of navigable waters.[148] It ended with no international conventions or agreements. The International Convention for the Prevention of Pollution of the Sea by Oil, held in 1954, began the international dialogue about oil pollution.[149] This first international attempt to address marine pollution was limited. The conference permitted the discharge of oil as long as it was as far as practicable from land.[150] However, if the oil discharge involved the ship's safety, was an unavoidable leak, or was a residue from the fuel or lubricating oil purification process, the convention did not impose liability.[151] The liability provisions permitted only the flag state to bring prosecutions. The circumstances of compliance were so broad, ships easily

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[148] Memorandum by the Secretariat of the United Nations: "Pollution of the Sea by Oil", Official Records, vol. 1, no. 169 (October 29, 1970).

[149] International Convention for the Prevention of Pollution of the Sea by Oil, opened for signature May 12, 1954, 12 U.S.T. 2989, 327 U.N.T.S. 31 (entered into force July 26, 1958, Amended April 11, 1962, 17 U.S.T.S. 332, October 21, 1969, 28 U.S.T. 1205) [hereinafter OILPOL]. The United States became a party to it on December 8, 1961. Congress enacted implementing legislation on August 30, 1961, the Oil Pollution Act of 1961.

[150] R. Michael M'Gonigle and Mark W. Zacher, Pollution, Politics, and International Law, 88-142, 241-51 (1979)

[151] Id.

avoided liability.[152] No minimum international pollution standards were set.[153]

In 1962 amendments to the 1954 Convention were made.[154] The amendments prohibited vessel discharge of oil or oily mixtures when they were within prohibited zones, generally 50 miles from nearest land.[155] Vessels had to be fitted to prevent spillage of oil into the bilges.[156] Records had to be kept documenting each cleaning of the tanks, ballasting, and discharges of oil or oil mixtures.[157] The signatory states were to establish penalties for violations and enforce the convention as amended.[158]

Between 1962 and 1971 the International Maritime Consultative Organization (IMCO) adopted a number of other amendments to the 1954 Convention.[159] In 1969, an IMCO

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[152] Michael S. Schenker, Saving a Dying Sea? The London Convention on Ocean Dumping, 7 Cornell Int'l L.J. 35 (1973).

[153] M'Gonigle et al., supra note 150.

[154] IMCO Resolution Adopting 1962 Amendments to the 1954 Convention, April 11, 1962.

[155] Id.

[156] Id.

[157] Id.

[158] Id.

[159] IMCO was created in 1958 as the organization within the United Nations that would be responsible for international marine problems, including oil pollution. It has advisory and (continued...)

resolution discarded the prohibited zone approach, and flatly prohibited all tanker discharges within 50 miles of land.[160] Once vessels sailed beyond the fifty miles, the resolution permitted tanker operational discharges of a restricted quantity and concentration.[161] 1971 amendments further established cargo tank arrangements and size limitations for new tankers, to limit the quantity of oil released upon grounding, collision, or some other casualty.[162] The United States ratified these various amendments, and implemented them by amending the Oil Pollution Act of 1961.[163] These conventions, amendments, and resolutions did not prevent one of the major oil spills of its day- the Torrey Canyon Spill.

In 1967 the Torrey Canyon, the thirteenth largest tanker in the world, spilled 60,000 tons of crude oil into

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[159](...continued)
consultative authority, but no regulatory powers. Kindt, supra note 99, at 1173.

[160] Focus on IMO: MARPOL 73/78, Int'l Mar. Org., at 12, May 1992 [hereinafter Focus on IMO].

[161] Id.

[162] Id. at 4.

[163] Oil Pollution Act of 1961, Pub. L. 87-167, 75 Stat. 402 (1961), codified at 33 U.S.C. §§ 1001-1015 (West 1993) amended by Pub. L. 89-551, §§ 1(2)-(8), 80 Stat. 372 (1966), codified at 33 U.S.C. §§ 1001-1004, 1008, 1009, 1011,1015; amended by Pub. L. 93-119, § 2, 87 Stat. 424 (1973), codified at 33 U.S.C. §§ 1001-1010, 1013, 1014; amended by Pub. L. 96-478, 94 Stat. 2303 (1980), codified at 33 U.S.C. §1001; amended by Pub. L. 97-449, §2(e), 96 Stat. 2440 (1983), codified at 33 U.S.C. § 1001.

the Atlantic.[164] This accident and the misguided cleanup efforts underscored the international community's unpreparedness.[165] Shipowners were under no legal obligations to insure against marine oil liabilities.[166] With no international marine pollution standards, civil liability depended on the coastal state's laws, if any, for relief.[167] Further, incidents covered by insurance were severely restricted by the policy limitations.[168] Public outcry about the Torrey Canyon spill pushed states to negotiate international conventions to address spills.[169] Maritime states supported these efforts to establish international standards,[170] because conflicting coastal laws with higher compliance costs would impede ocean commerce, which accounts for about 95 percent of all

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[164] Charles A. Trabant, Intervention on High Seas Act, 7 Law and Policy in Int'l Business 3003-305 (1975).

[165] Ten days of debate followed the accident's occurrence. Government officials chose to bomb the Torrey Canyon as a solution to its spill. The bombing caused more ecosystem damage than the oil spill had caused. Abel Wolman, Pollution as an International Issue, 47 Foreign Affairs 172 (1968).

[166] Frederick J. Carr, Statutory Liability for Oil Pollution From Vessels in Marine Environments, 3 U.S.F. Maritime Law Journal 267-323 (1991).

[167] Id.

[168] Id.

[169] Bodansky, supra note 142, at 725-728.

[170] Id.

international trade.[171] Thus, international liability and compensation regimes were born.

2. International Liability Conventions

IMCO reacted to the Torrey Canyon incident by filling the holes in international marine law with two international conventions - the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties[172] and the International Convention on Civil Liability for Oil Pollution Damage (CLC).[173] This initial tact taken to address oil spills created liability and compensation regimes, rather than requiring costly preventative measures. Liability schemes made shipowners pay for oil spill damages only after they occurred, if ever, rather than mandating costly prevention measures that earned no profit. The first liability regimes provided little meaningful compensation for oil damages and failed to induce preventative measures.[174]

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[171] Robin R. Churchill & Alan V. Lowe, The Law of the Sea 203 (2nd Ed. Rev. 1988).

[172] International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, Nov. 29, 1969, 26 U.S.T. 765, 9 I.L.M. 25 (entered into force May 6, 1975).

[173] International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 973 U.N.T.S. 3, reprinted in 9 I.L.M. 45 (1970) [hereinafter CLC].

[174] Yvonne L. Tharpes, International Environmental Law: Turning the Tide on Marine Pollution, 20 Inter-American L.R. 579, 609-610 (1989).

The International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties cloaked coastal states with broad powers to intervene only when pollution or the threat of pollution was imminent.[175] It contained neither adequate compensation provisions nor preventative measures.[176] Preventative measures would have required the refitting and redesign of vessels, a costly measure for marine states.[177] It did not cover the intentional discharges resulting from a ship's normal operation.[178] The convention did address accidental oil pollution from privately-owned ships of a signatory state, but clearly the freedom of shipowners and cargo owners were

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[175] Parties may take such measures on the high seas as may be necessary to prevent, mitigate or eliminate grave and imminent danger to their coastline or related interests from pollution or the threat of pollution. CLC, supra note 173, Art. I. Before taking action, a coastal state should notify the flag state of the ship, consult independent experts and notify any person whose interests may reasonably be expected to be affected by such action. In cases of extreme urgency, measures may be taken at once. In any case, the coastal state must endeavor to protect human life and assist persons in distress. CLC, supra note 173, Art. 3.

[176] See Tharpes, supra note 174.

[177] As noted in Crude Awakening, supra note 9, at 9, the petroleum and tanker industries must keep tankers moving with full oil loads to earn their keep. Transportation of oil means uninterrupted profit flows, and any delay to retrofit vessel, or to insure preventative measures are implements affects profit and jobs.

[178] See Focus on IMO, supra note 160. Tankers routinely clean the tanks by pumping the bilge into the ocean. The bilge will be various concentrations of oil. Other intentional discharges include those that inevitably occur when oil is transferred to or from the tanker, and oil wastes that may be discharged minimum distances offshore. Id. at 16.

of paramount concern.[179] An intervening coastal state must balance the measures to be taken against the potential damage. The convention only provided compensation for damages incurred when coastal states unreasonably interfere with ships when investigating oil pollution.[180]

IMCO developed the CLC, the primary convention covering intentional or accidental marine oil pollution damage, in 1969. The CLC instituted general international rules to ensure adequate compensation for oil pollution damages.[181] It is the sole remedy for oil pollution damage within a signatory state's territory.[182] The vessel owner is deemed absolutely liable for cleanup costs and damages, and all claims against him must be made in accordance with the CLC. No liability would lie if the owner proved the damage was caused by acts wholly outside of its control.[183] Vessel owners are required to maintain insurance or other financial security equal to the liability limits.[184] The shipowner could limit his liability under the CLC by establishing a fund reflecting the total sum of its

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[179] See Carr, supra note 166; Bodansky, supra note 142.

[180] See Bodansky, supra note 142.

[181] Anthony Manieri, Civil Liability for Vessel Source Oil Pollution Damage: A Multilateral Problem in Need of a Multilateral Solution, 14 Suffolk Transnat'l L.J. 457 (1991).

[182] Id.

[183] Id.

[184] CLC, supra note 173, art. VII § 1.

liability limit.[185]

In a short time, these compensation measures were found lacking.[186] Only damage within the territorial sea of a contracting state was recoverable under the CLC.[187] The liability limit set by the CLC was $175 per ton of the ship's tonnage or $18.5 million, whichever was less.[188] To put these amounts into perspective, one must remember the total damages from tanker oil spills generally totalled many times that limit.[189] The oil pollution caused by a fire or an explosion of a tanker is not compensable under the CLC.[190] Also excluded from CLC coverage are all spills of non-persistent oils, like gasoline, light diesel oil, and kerosene.[191] No preventive measures or design standards were established with the CLC.

In 1971, another international conference established the International Fund for Oil Pollution Damage ("Fund

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[185] CLC, supra note 173, art. V(3).

[186] Manieri, supra note 181.

[187] Id.

[188] Carr, supra note 166, at 306-7.

[189] Cost for the Exxon Valdez could reach $90,000 per ton discharges. Major spills in U.S. waters over the past twenty years averaged about $28,000 per ton spilled. These figures represent claims made under then existing laws, and do not represent the full costs of a spill. Tanker Spills, supra note 9, at 155-160.

[190] Carr, supra note 166.

[191] Carr, supra note 166.

Convention").[192] The Fund Convention attempts to correct the financially inadequate CLC provisions. Despite these attempts, many states have refused to ratify either the CLC or the Fund Convention, because the liability and compensatory schemes were inadequate to address costly oil spills.[193] The Fund Convention addresses the inadequate compensation issue, but does not establish a liability scheme.[194] It provides compensation to claimants who were not normally compensable under the CLC or who would incur losses due to the shipowner's inability to meet his financial obligations under the CLC.[195] Like the CLC, the Fund Convention also failed to set prevention methods or standards.

The Protocol of 1984 to Amend the International Convention on Civil Liability for Oil Pollution Damage (the

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[192] International Convention for Oil Pollution Damage, Dec. 18, 1971, reprinted in 11 I.L.M. 284 (1972) [hereinafter Fund Convention].

[193] The United States specifically refused to implement or ratify the two conventions. See generally Manieri, supra note 181, at 463.

[194] The Fund Convention compensates claimants when the shipowner is not financially able to pay damages, or is not liable, or when the damages exceed the CLC limits. Shipowners and cargo owners split the financial responsibility equitably under the Fund Convention. Contributions to the fund are mandatory from all who receive in excess of 150,000 tons of oil annually. Fund Convention, supra note 192.

[195] Id.

1984 CLC Protocol)[196] and the Protocol of 1984 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (the 1984 Fund Convention Protocol)[197] made a variety of changes to the compensation and liability regimes. The 1984 CLC Protocol increased the number of people exempted from CLC liability.[198] It also created a compulsory insurance program to require liability coverage, and to insure claimants will be able to obtain reimbursement for cleanup costs.[199] The 1984 CLC Protocol imposed primary liability

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[196] Protocol of 1984 to Amend the International Convention on Civil Liability for Oil Pollution Damage, 1969, reprinted in 15 J. Mar. L. & Com. 613-22 (1984) [hereinafter 1984 CLC Protocol].

[197] Protocol of 1984 to Amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971, reprinted in 15 J. Mar. L. & Com. 623-33 (1984) [hereinafter the 1984 Fund Convention Protocol].

[198] 1984 CLC Protocol, supra note 196, art.IV(2). Article IV excludes the following from liability:

a. the servants or agents of the owner or the members of the crew;

b. the pilot or any other person who, without being a member of the crew performs services for the ship;

c. any charterer, manager, or operator of the ship;

d. any person performing salvage operations with the consent of the owner or on the instructions of competent public authority;

e. any person taking preventative measures;

f. all servants or agents of persons mentioned in subparagraphs (c), (d), and (e).

The 1969 CLC only precluded claims against the servants or agents of the owner. Carr, supra note 166.

[199] 1984 CLC Protocol supra note 196, art. VII.

for damages created by oil spills of the shipowner,[200] and extended the geographic scope of application to the 200-mile EEZ.[201] While these changes improved the liability and compensation regime, they did nothing to support the best cure - an "ounce" of prevention.[202]

3. Private Liability and Compensation Agreements

Two private international agreements supplement the international laws for liability and compensation - the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP)[203] and the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL).[204] TOVALOP members include 98 percent of the total world tanker tonnage and compensates governments for cleanup costs for negligent tanker oil spills.[205] CRISTAL expands potential claimants to include private parties, while increasing the coverage limit from $10 million under

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[200] Jurisdiction is limited to the courts of the coastal state affected. See 1984 CLC Protocol supra note 196, art. VIII.

[201] Id.

[202] Manieri, supra note 181, at 465.

[203] Signed Jan. 7, 1969, reprinted in 8 I.L.M. 497 (1967) [hereinafter cited as TOVALOP].

[204] Signed Jan. 14, 1971, reprinted in 10 I.L.M. 137 (1971) [hereinafter cited as CRISTAL].

[205] TOVALOP, supra note 203.

TOVALOP to $30 million.[206] Parties to CRISTAL are oil companies, whereas parties to TOVALOP are tanker owners or bareboat charterers.[207] The agreements provide for dispute resolutions to take place under international rules of conciliation and arbitration for TOVALOP, and by English courts for CRISTAL.[208] TOVALOP establishes tanker owner liability for oil removal and offers some compensation for damages.[209] CRISTAL provides compensation for oil pollution damage that directly results from oil owned by a member oil company.[210]

A 1984 revision to TOVALOP made significant changes.[211] It raised the liability limit from $10 million to $16.8 million.[212] TOVALOP expanded damage recovery to include any person, not just governments.[213]

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[206] Dempsey & Helling, Oil Pollution by Ocean Vessels- An Environmental Tragedy: The Legal Regime of Flags of Convenience, Multilateral Conventions, and Coastal States, 10 Den. J. Int'l. L. & Pol'y 37, 68 (1980) [hereinafter cited as Dempsey & Helling]

[207] CRISTAL, supra note 204.

[208] Bernadette V. Brennan, Current Development, Liability and Compensation for Oil Pollution from Tankers Under Private International Law: TOVALOP, CRISTAL, and the Exxon Valdez, 2 Geo. Int'l Envtl. L.Rev. 1, 7-8 (1989).

[209] Id. at 5-6.

[210] Id. at 6-7.

[211] Id. at 3-8.

[212] Id.

[213] Id.

The 1984 TOVALOP plainly established tanker owner liability, whereas the earlier version simply acknowledged the tanker owner's duty to remove the oil.[214] The revision establishes a strict liability standard, while the 1969 version employed a negligence standard.[215] TOVALOP now applies to the territory and territorial seas of a state, not just to coastal contamination as in the 1969 version.[216]

A formal supplement to TOVALOP in 1987 made further significant changes. It applies to spills where the tanker owner is party to TOVALOP and where the oil is owned by an oil company party to CRISTAL.[217] The owner liability limits were raised to a range of $3.5 million to $70 million, depending on the gross weight of the tanker.[218] This private "insurance" may cover damages for both the tanker owner and the oil companies.[219] Under the supplement, compensation is only paid to the extent claimants have not been paid under the CLC and the Fund Convention.[220] Once again, opportunities to minimize

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[214] Id.

[215] Id.

[216] Id.at 4-5.

[217] Id.

[218] Id.

[219] Id.at 8-9.

[220] Id.at 8.

pollution damage by mandatory preventative measures were not provided.

4. International Preventive Measures

In 1973, the international community began to develop preventative measures for vessels. Rather than using existing liability and compensation regimes, IMCO generated new conventions adding to the ad hoc pattern of marine pollution laws. The International Convention and Protocol for the Prevention of Pollution from Ships (MARPOL) created five annexes with detailed standards for pollution control.[221]

Annex I specifies methods to prevent oil pollution. MARPOL established discharge standards, construction, design, equipment, and manning standards (CDEM), and navigation restrictions and regulations.[222] The discharge standards focused primarily on intentional, operational discharges.[223] The CDEM standards aim to prevent pollution by minimizing the risk of accidents.[224] The navigation standards also aimed to prevent pollution by reducing the likelihood of accidents at sea.[225] MARPOL

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[221] MARPOL, supra note 147.

[222] Id.

[223] Id.

[224] Id.

[225] Bodansky, supra note 142, at 730.

also identified a small number of "special areas" where the threat of marine oil pollution is especially great.[226] This first effort at required prevention methods fell flat. MARPOL did not come into force internationally, because not enough maritime states ratified it.[227]

In 1978 IMCO held the International Conference on Tanker Safety and Pollution Prevention.[228] The United States took the lead and proposed a series of tanker safety measures.[229] The conference included the 1973 version of MARPOL with new measures in the Protocol of 1978 Relating to the International Convention for the Prevention of Pollution from Ships (known as MARPOL 73/78).[230] MARPOL 73/78 established oil tanker design and construction requirements, applicable only to seagoing vessels, not those operating

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[226] Id. A "special area" designated an area of the ocean that must adopt stricter operational discharge conditions. An area is chosen for specific reasons like its marine and ecological conditions. No other escort or avoidance requirements are set to protect these areas. Focus on IMO, supra note 160, at 7.

[227] Tharpes, supra note 174, at 610.

[228] IMCO, The International Conference on Tanker Safety and Pollution Prevention, Feb. 2-20, 1978, reprinted in 17 International Legal Materials 546 (1978).

[229] The United States' initiative grew along with public concern over several large tanker spills that threatened its waters. It recognized the need for prevention techniques since cleanup measures proved ineffective. H.R. Rep. No. 1224, 96th Cong., 2d Sess., 2 (1980) [hereinafter House Report], reprinted in 1980 U.S.C.C.A.N. 4849.

[230] MARPOL 73/78, supra note 147.

solely in internal waters.[231] The requirements extended to all new crude oil tankers of more than 20,000 dead weight ton (dwt), and new product carriers greater than 30,000 dwt.[232]

Ships must undergo an initial survey before they can be put into service or be issued an International Oil Pollution Prevention Certificate (IOPP).[233] The IOPP documents that the vessel's pollution control equipment and measures are aboard and functioning.[234] IOPPs must be aboard all vessels entering the waters of MARPOL nations.[235] Periodic surveys every five years must be conducted to maintain the certificate. Unscheduled surveys must also be carried out in accordance with MARPOL 73/78.[236]

MARPOL 73/78 established design and construction standards. All existing tankers carrying crude oil had to operated with either segregated ballast tanks (SBT),[237]

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[231] Carr, supra note 166, at 313; House Report, supra note 229, at 7.

[232] Dead weight ton is the weight of the tanker fully loaded, as distinguished from the weight of only its load. See House Report, supra, note 229.

[233] House Report, supra note 229, at 13.

[234] Id.

[235] MARPOL 73/78 , supra note 147, Annex I.

[236] Id.

[237] Id. Segregated ballast tanks (SBTs) provide balance to vessels without relying on cargo tanks for ballast purposes. Tanker Spills, supra note 9, at 47.

clean ballast tanks (CBT),[238] or approved crude oil washing systems (COW).[239] All existing product carriers greater than 40,000 dwt had to have either SBT or CBT before MARPOL 73/78 entered into force.[240] These SBT, CBT, and COW measures reduce the discharge of oil into the oceans during normal shipboard operations, but do little to safeguard against spills from grounding or collisions.[241]

Other MARPOL 73/78 requirements were aimed to minimize spills by requiring certain tanker design measures like protectively located ballast tanks in the vessel to reduce the likelihood of oil discharge in the event of a grounding or collision.[242] These measures were not as extensive as they may seem. MARPOL 73/78 exempted many tankers from the SBT requirements due to age.[243] As a result, about 65% of the world tanker fleet sails legally without the extra

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[238] Clean ballast tanks are tanks dedicated solely to carrying ballast water. Focus on IMO, supra note 160.

[239] Crude oil washing (COW) is a superior cargo tank cleaning system that uses the cargo oil as the washing medium. It is designed to reduce sludge and clingage, as well as reduce operational oil pollution. Id. at 49.

[240] Id. at 313-314.

[241] See Tanker Spills, supra note 9, at 16.

[242] Proceedings of the Marine Safety Council, U.S. Coast Guard, Special Issue on Tank Vessels, vol. 48, no. 4, Jul-Aug 91 at 16 [hereinafter Safety Council]; MARPOL 73/78, supra note 147, Annex I.

[243] MARPOL 73/78, supra note 147, Annex I.

stability SBT provides.[244] Of those vessels that do comply with MARPOL 73/78 SBT requirements, only half have the SBT protectively located in their hulls so as to minimize spills from collisions or groundings.[245] Ironically, MARPOL 73/78 grew from efforts to prevent accidental spills, but instead it addressed intentional, operational oil discharges and the design changes actually increased the risk of large oil spills.[246] The new vessels constructed to MARPOL 73/78 specifications were made broader and shorter, with greater areas of the hull to be protected from corrosion. Most SBT designs, and the significant reduction of the deck and bottom plate thickness permitted by MARPOL 73/78 significantly increase the potential size of an oil spill upon grounding.[247]

Given the dearth of data on the amounts of oil entering the sea, MARPOL 73/78 also began using reporting requirements to gather data. To assist in the report requirements MARPOL 73/78 mandated equipment measuring the

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[244] Id.

[245] Id.

[246] Tanker Spills, supra note 9, at 50-51. For example, the designs created more surface area that would corrode and weaken, thereby increasing risks of hull fatigue and breaching. The thinner decks and bottom plates threatened faster corrosion and weakening as discussed earlier. SBTs changed the tankers' loading design, creating greater oil outflow in groundings. Id.

[247] Id.

concentration of oil discharged intentionally to the sea.[248] Vessels must maintain information necessary to verify the use of proper loading procedures.[249] All transfers of oil and oily waste must be logged for all internal and external ship transfers and discharges. The same log must document the operability of the transfer and pollution-prevention equipment.[250]

Between 1984 and 1990, IMCO, then renamed the International Maritime Organization (IMO), honed MARPOL 73/78 several times. These amendments came into force by tacit agreement[251] to cover operational oil discharges[252] and to identify one area as "special"

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[248] MARPOL 73/78, supra note 147, Annex I. Safety Council, supra note 242, at 16.

[249] Safety Council, supra note 242, at 16.

[250] Id.

[251] After an amendment has been adopted by an IMO meeting of contracting parties, IMO members and nonmembers, the amendments automatically enter into effect on a set date unless the amendments are rejected within 10 months by one-third of the contracting parties, or by contracting parties whose combined fleets are at least 50 percent of the world's gross tonnage. This method insured IMO conventions came into force much more quickly, than under the old method of positive acceptance by two-thirds of the contracting parties. Focus on IMO, supra note 160, at 6.

[252] For example, the 1984 amendments, adopted on Sep. 7, 1984 and entered into force on Jan. 7, 1986, focus on solving the practical implementation problems associated with intentional oil discharges. Focus on IMO, supra note 160, at 14.

affording it greater protection against oil discharges.[253] None of the amendments of that time period created further preventive measures against oil spills.

5. Enforcement of Preventive Measures

Laws and conventions may supply terrific solutions to problems, but the real key to a law's effectiveness is enforcement of the law. MARPOL 73/78 standards have been in force for many years now,[254] but enforcement of its standards has been convoluted and to some extent ineffective against oil spill prevention. Enforcement of international conventions falls on whoever has jurisdiction to enforce. Jurisdiction over vessels depends upon the flag they fly, their age, and the waters they sail.

The Convention of the Law of the Sea (LOS) defines the jurisdictional reach of states under international and national marine conventions and agreements.[255] The LOS creates a broad constitutional framework within which states

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[253] The 1987 amendment made the Gulf of Aden a "special area," thereby, affording it greater protection against oil discharges. Id. at 17.

[254] MARPOL 73/78 has been ratified by 78 countries and applies to 90 percent of the world merchant fleet. Int'l Mar. Org., 1991 MARPOL Amendments Enter into Force, IMO News, No.2, at 2 (1993) [hereinafter IMO News].

[255] The United Nations Convention of the Law of the Sea, opened for signature Dec. 10, 1982, 21 I.L.M. 1261 [hereafter cited as LOS].

should use and protect the oceans.[256] It imposes a general obligation for all states to protect and preserve the marine environment and to minimize marine pollution.[257] Specific provisions require states to cooperate on a global or regional level to set environmental standards for vessel-source pollution, to notify other states of imminent pollution dangers, to develop contingency plans, and share scientific research and information.[258] The LOS sets forth duties of states respecting land-based pollution, seabed activities and atmospheric sources.[259] IMCO, renamed the IMO, is, by implication in Article 211 of the LOS, the international body which will govern vessel-source pollution.[260] IMO will apply generally accepted international rules and standards to control pollution under the LOS. This leaves in place for civil remedies the public international conventions and private international agreements discussed above. Significantly, the LOS also leaves implementation of international standards it establishes to individual states.[261] This means jurisdictional issues may still leave the ocean unprotected.

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[256] Bodansky, supra note 142, at 721.

[257] LOS, supra note 255, arts. 192, 194.

[258] Bodansky, supra note 142, at 722.

[259] Id. at 721-724.

[260] Id. at 740.

[261] Id. at 740-741.

Traditional principles of the sea give the flag states jurisdiction over their vessels. Growing pollution problems have lead coastal states to seek jurisdiction over vessels which pollute their shores.[262] The tug between the interests of competing states still favors the maritime states. The competing states are broken down into three categories - flag state, coastal state, and port state jurisdictions.[263]

Flag state jurisdiction follows the traditional law of the sea imposing the vessel's own flag state jurisdiction for its activities.[264] The only limitation to this jurisdiction has been when the vessel is in the territory of another state. It is based on the principle that a state has exclusive enforcement jurisdiction within its territory. The criticism of flag state jurisdiction's effectiveness against marine pollution has been its adequacy to control

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[262] Id. at 744-759.

[263] Id. at 736-740. A nation may permit ships to fly its flag, thereby granting its nationality to the ship. These nations, known as flag states, recognize a vessel flying its flag as a floating part of that nation for jurisdictional purposes. Many nations are flag states including the United States, Liberia, Panama, France, Turkey, Honduras, Costa Rica, Norway, Sweden, Denmark, Greece, Great Britain, Germany, and Japan. Coastal states are those states whose coasts border the oceans, and often suffer the effects of vessel-source pollution. Port states are sometimes coastal states as well (if pollution hits their shores), but usually port states just provide a stop along the marine commerce routes which gives port states the least justifiable power to interfere with visiting vessels in marine law. Id.

[264] Id. at 741-744.

problems which do not affect the flag state.[265] Shipowners have taken advantage of this lawful loophole to strict pollution control by registering their ships in states that have lax or nonexistent marine pollution laws.[266]

The LOS preserves the primacy of flag state jurisdiction. It places obligations to prevent, reduce and control marine pollution on the flag state.[267] Since flag state enforcement actions and penalties have been viewed as ineffectual, the LOS attempts to force flag states to adhere to generally accepted international standards.[268] The LOS incorporates by reference the international conventions, and standards promulgated by a competent international organization.[269] Under the LOS, a flag state must then adhere to those generally accepted standards, even though it may not be a party to the convention establishing the standards.[270]

By sharp contrast, coastal and port states have limited jurisdiction over establishing marine pollution

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[265] Id.

[266] L.F.E. Goldie, Environmental Catastrophes and Flags of Convenience-- Does the Present Law Pose Special Liability Issues, 3 Pace Y.B. Int'l L. 63 (1991).

[267] Bodansky, supra note 142, at 741-744.

[268] Id. at 743.

[269] Id. at 740.

[270] Id. at 741-744.

controls.[271] Coastal state jurisdiction is defined by the zones of the ocean - internal waters, territorial sea, contiguous zone, and the EEZ.[272] When a marine pollution incident occurs, the coastal state's jurisdiction over the polluter depends on where the vessel was at the time of the incident. Coastal states may require vessels within its internal waters to comply with international standards and may enforce these standards.[273] Coastal states may also institute national CDEM standards for vessels entering their ports and internal waters.[274] The jurisdictional power within territorial seas differs. Under the LOS, coastal states may prescribe international standards, but not CDEM standards.[275] To further safeguard its territory, coastal states may designate particular sea lanes and traffic schemes without impinging on vessels' right to pass through the waters enroute to some other state.[276] This right to free passage, referred to as the right to innocent passage, exists when a vessel has not committed a crime against the coastal state during its passage through territorial waters. The LOS extends coastal states' jurisdictional reach by

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[271] Id. at 767-768.

[272] Id. at 744-759.

[273] Id.

[274] Id.

[275] Id.

[276] Id.

authorizing them to prescribe pollution standards within their EEZ.[277] Once a vessel is past the EEZ on the high seas, the LOS rests exclusive jurisdiction in the flag state.[278] The LOS views the public and private international conventions as sufficient to recompense any damages to a coastal state caused by a vessel's pollution on the high seas.[279]

Port state jurisdiction is expanded significantly by the LOS.[280] The LOS gives port states jurisdiction over pollution incidents occurring in the high seas or another states's coastal waters.[281] Port states may enforce applicable international standards and rules, and may prosecute any violations at the request of the flag state, the coastal state, or any injured state.[282] But the applicable international standards and rules are not clear.[283] Port states have exercised their enforcement jurisdiction sparingly. A number of European states created

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[277] LOS, supra note 255, art. 211(5), 21 I.L.M. at 1311.

[278] Bodansky, supra note 142, at 741-744.

[279] See generally Bodansky, supra note 142.

[280] Port states are those whose coastal areas permit customary entry and exit of ships generally for commerce purposes. Id. at 759.

[281] Id. at 759-764.

[282] Id.

[283] See generally Bodansky, supra note 142, at 761.

a cooperative port inspection program to insure vessels comply with international CDEM standards and to investigate possible discharge violations.[284] At this time, no port state has exercised jurisdiction over discharge violations occurring on the high seas.[285]

The LOS does have a dispute settlement system which some commentators hail as the prototype for all international environmental disputes.[286] It is a mandatory, yet flexible system of dispute resolution. The dispute settlement is divided into three parts: 1. general provisions; 2. compulsory provisions with binding decisions; and 3. limits and exceptions to the compulsory proceedings.[287] Parties to the dispute are permitted to choose their means of dispute settlement, e.g., negotiation, enquiry, mediation, arbitration.[288] Each state party may

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[284] Id.

[285] Id. at 763.

[286] John Warren Kindt, Dispute Settlement in International Environmental Issues: The Model Provided by the 1982 Convention on the Law of the Sea, 22 Vand. J. Transnat'l L. 1097 (1989).

[287] Id.

[288] Id. For the first time in international law, all major world powers agreed to a standard set of dispute provisions in the LOS. The LOS Convention binds all parties to peacefully settle all disputes. Disputing parties may choose by mutual agreement their method of dispute settlement and tailor it to the particular problem. Once parties choose a particular resolution tool, it becomes the only tool given effect under marine law. The LOS then codifies the choice into a binding system for the dispute. If the parties fail to (continued...)

choose only one of four forums to which it will submit to compulsory adjudication, but may also choose the forum or forums which it finds unacceptable.[289] While this represents an overarching dispute resolution, the LOS still is not in effect worldwide, because not enough states have ratified the LOS.[290]

Overall, significant gaps exist in the international regime developed to address marine oil pollution. The LOS is still not ratified by enough states to put it into effect worldwide. This leaves MARPOL 73/78 to be implemented under the historical, time-honored jurisdictional rules described earlier.[291]

Flag states under either the traditional jurisdictional rules or those set by the LOS are empowered to enforce vessel design, construction, and other preventative requirements. Nations that have ratified IMO conventions generate implementing domestic legislation.[292] The

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[288](...continued)
resolve the dispute by negotiation or cannot agree on which settlement method to use, the LOS sets out compulsory procedures to follow that will result in binding decisions. Id.

[289] Id.

[290] Bodansky, supra note 142, at 723.

[291] See supra notes 140 to 146 and the associated text.

[292] See Tharpes, supra note 174, 607-611. The international conventions set general design, construction, and maintenance requirements, leaving the flag states to interpret international standards with specific domestic
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legislation establishes specific standards of construction, design and inspection. Design, construction, and maintenance requirements are worthless unless thorough inspections verify compliance with international standards. Thus, inspection serves an important part in enforcement. However, "freedom of the seas" still sets the tone for international marine pollution laws.

MARPOL 73/78 requires the flag state to inspect for international compliance, and to issue a certificate of compliance to those vessels meeting the requisite standards.[293] The certificates are valid for five years if annual inspections show the ship has been properly maintained.[294] If renovation or repairs are deemed necessary, they must be completed prior the certificate's renewal.[295] Most flag states conduct their own inspections, but with growing registry of vessels under "flags of convenience," private parties, known as

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[292](...continued)
legislation. Problems arise when certain flag states, like Liberia or Panama, either do not establish laws to implement international conventions, or establish such lax interpretations of the conventions that ships flagged under these states effectively sail free of international constraints. Goldie, supra note 266.

[293] Tanker Spills, supra note 9, at 50-51. The domestic standards should be identical to the standards set by international conventions, but variations are common. Bodansky, supra note 142, at 724-72.

[294] Tanker Spills, supra note 9, at 51.

[295] Id.

classification societies, are hired to perform all or part of the inspections.[296]

Classification societies set their own standards and rules that meet international convention requirements such as those under MARPOL 73/78 for vessel design, construction, and surveys.[297] Eleven leading classification societies banded together as the International Association of Classification Societies (IACS).[298] The IACS possess technical capabilities surpassing many nonmember private societies that help keep construction and maintenance standards uniform within the IACS.

The requirements established by societies are many, but do not include issues like safety equipment, crew training or qualifications. Classification societies do address hull

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[296] See Goldie, supra note 266. "Flags of convenience" refer to those nations whose marine pollution laws are comparatively lax. Tankers that are perhaps fairly old, or poorly maintained or constructed or operated may register in that nation despite few real connections to the nation. Tanker owners benefit from such registries, because costs of doing business and meeting flag state standards are the cheapest worldwide. The global commons in question here, namely the oceans, do not reap great protection from such open registry. Id. See also Tanker Spills, supra note 9, at 51.

[297] Tanker Spills, supra note 9, at 52.

[298] Id. The eleven leading classification societies belong to the International Association of Classification Societies (IACS). They are: the American Bureau of Shipping, Bureau Veritas (France), China Classification Society, Det norske Veritas (Norway), Germanischer Lloyd (Germany), Korean Register of Shipping, Lloyd's Register of Shipping (United Kingdom), Nippon Kaiji Kyokai (Japan), Polski Rejestr Statkow (Poland), Registro Italiano Navale, and USSR Register of Shipping. Id.

materials, machinery components, structural designs, machinery and welding.[299] Societies issue classification certificates to vessels meeting their rules.[300] These rules help reduce insurance rates.[301] Once a ship has been delivered, it must maintain its "in class" status to keep favorable insurance rates, and be in compliance with international conventions.[302] Periodic or continuous inspections are made to insure a vessel stays "in class."[303]

Inspections and surveys of vessels are extremely time consuming. Thorough inspection of vessels requires more time than either the states can afford to devote given their work load and manning, or that the tanker owners are willing to lose by delaying tankers long enough in port to permit such

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[299] Id.

[300] Id.

[301] Id.

[302] Id.

[303] Id. Periodic surveys were set up as annual and special surveys. The annual surveys fail to include in-depth inspection unless there is cause for concern. "Special surveys of hull and machinery are spaced at four-year intervals, although the society often grants a 'year of grace' unless there is a compelling reason to deny it. Therefore, special surveys tend to fall at age 5, 10, 15, etc. The basic purpose of the special survey system is to assure the vessel's ability to trade successfully until the next scheduled special survey." Id. at 53.

an inspection.[304] Coastal and port states often rely on flag states to perform the inspections, but have the right to inspect the certificate and the vessel.[305] Flag states thus turn to classification societies to shoulder some of the inspection duties.[306]

Flag states also rely on operator inspections. Operator inspection is very attractive and economically

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[304] Tanker Spills, supra note 9, at 55. It is also important to remember that tanker owners view time as money in the oil transportation business. Any delay in a tanker's schedule is deemed unprofitable to the owners. See Crude Awakenings, supra note 9, at 9-12.

[305] See Bodansky, supra note 142. The LOS sets out a balance of power between the interests of maritime states and coastal/port states. Maritime states (also referred to as flag states) are those with significant naval or maritime fleets busy in commerce. While maritime states fight to protect and maintain their rights to innocent passage, coastal/port states seek to protect their waters from pollution with enforcement powers. The LOS provides coastal/port states with the jurisdiction to enforce vessel-source pollution laws against vessels within their legal reach. The enforcement powers diminish with the vessel's distance from the state's coastline. If the vessel is in the internal waters, the coastal/port state has its strongest recognized enforcement powers. However, let that vessel travel out to the EEZ, and vessels enjoy high seas navigation rights subject only to the flag state's control. Id. Specific coastal/port states have enacted more stringent laws than the LOS. These laws extend full, undiminished jurisdiction over vessel-source pollution in internal, territorial, and EEZ waters. See e.g. OPA, supra note 11.

[306] Tanker Spills, supra note 9, at 55. One such flag state is the United States. The United States Coast Guard spends between 11 and 36 hours to inspect a hull for certification or reinspection. To thoroughly examine a vessel as required would take many more hours than the Coast Guard can provide. To finish the inspection the Coast Guard can only start, it relies on either classification societies or the flag state of a foreign flagged vessel to conduct international tank inspections. Id.

efficient, because, for example, the inspection of the supertankers requires more time than is allotted for a tanker's stop in port.[307] To prevent slowing down commerce, many flag states support operator inspections. Tanker owners likewise prefer operator inspections made while the tanker is underway to save money and time. Since many flag states carry out the inspections differently with varying degrees of compliance required, there is no guarantee that ships flying different flags will conform with the same rules.

Although international conventions would seem to promote uniformity in ship design, inspection, maintenance and construction, the many players who apply and interpret the international standards for ships create a myriad of nonmatching requirements and inspections. Some states strictly interpret and enforce the international requirements, while others protect their fleet from costly compliance by not enforcing standards. Both public and private entities contribute to this diversity of standards. The IACS, nonmember societies, individual flag states and

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[307] Id. at 55. Such an arrangement may be efficient and inexpensive, but does it really force shipowners to enforce standards and maintain vessels? Critics of the oil industry argue that allowing 20,000 barrels of oil to leak is cheaper than bringing the tanker out of transit for repairs and chartering another tanker to carry the oil. Tankers only earn profits while carrying cargo. Any delay in shipments costs the owners money. This philosophy seems to run counter to shipowners taking the time (and time is money) to correct maintenance problems and perform repairs until it is profitable to do so. Crude Awakenings, supra note 9, at 9-10.

operators have responsibilities to assess and enforce the general international standards differently. Implementing laws of one flag state often seem to conflict with the standards set by another flag state under the very same international convention.[308] Some commentators view the array of implementing domestic laws and inspections as barely adequate to insure compliance with international conventions.[309] The confusing piecemeal approach found in international marine pollution laws infected U.S. domestic oil spill laws for years as reviewed.

IV. Development of U.S. Oil Spill Laws

U.S. marine oil pollution laws developed in reaction to crises along two separate paths - one related to vessel safety, and the other specifically treating vessel-source oil spills with a myriad of liability and compensation laws. The failure of these approaches eventually led Congress to appreciate the importance of spill prevention. In 1980, Congress finally enacted laws forcing some prevention measures on tankers. As with international marine pollution laws, these U.S. laws regulated some aspects of spill prevention, yet missed important areas in their ad hoc approach.

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[308] Id. at 60.

[309] Id. at 55.

A. Vessel Safety Laws

Port safety and security within U.S. waters prompted action on the vessel safety path.[310] During the period prior to U.S. involvement in World War I, a terrible explosion rocked Jersey City. Feelings ran high that the explosion was the result of sabotage.[311] Federal regulation of water carriers grew from this explosion.[312] The volatility of petroleum and its products led to its regulation by the myriad of transportation safety laws enacted. As years passed, the Coast Guard shouldered the responsibility for inspecting all vessels in U.S. waters carrying dangerous cargoes.[313]

The Torrey Canyon disaster startled Congress into

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[310] Explosives Laws Need Untangling, N.Y Times, August 1, 1916, at 3. An explosion of high explosive munitions near New York Harbor in 1916 sparked concerns about espionage as the cause, but also revealed sheer carelessness of munitions storage and transportation over water. Id.

[311] Held as Plotters in Black Tom Fire, N.Y. Times, Aug. 10, 1916. The explosive fire in Jersey City came to be known as the "Black Tom" fire. Id.

[312] Although not directly related to pollution, an espionage bill sprang forth from the Black Tom plot which empowered the Secretary of Transportation to regulate the anchorage and movement of any vessel within the territorial waters of the U.S., to inspect those vessels, and if necessary to prevent injury or harm to U.S. harbors or waters, to possess and control the offending vessel. H.R. Conf. Rep. No. 65, 65th Cong., 1st Sess. at 4 (1917).

[313] The Bureau of Marine Inspection and Navigation began in 1838 as the Steamboat Inspection Service, and was incorporated into the Coast Guard in 1946. Clayton W. Evans, Reacting to Disaster: The Development of Port Safety and Security Programs, (Dec. 1982) (unpublished M. Envtl. Mgmt. Thesis, University of Michigan).

further legislation designed to safeguard U.S. ports and waterways.[314] The Ports and Waterways Safety Act of 1972[315] strengthened the Coast Guard's tools to prevent marine mishaps and marine pollution. This act addresses pollution by improving existing vessel's design, construction, maintenance, and operation.[316] The systems approach of this act empowered the Secretary of Transportation to establish vessel traffic systems in congested traffic areas, along with oversight of technical vessel requirements.[317] Subsequent oil spills within U.S. waters highlighted the inadequacies of the Ports and Waterways Safety Act.[318] Critics blasted the act claiming no standards were set to implement tanker safety measures, and that Congress significantly weakened the act by exempting large numbers of vessels from the act's

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[314] Oil Slick Sweeps Shores Of Britain: Big Tanker Splits, N.Y. Times, Mar. 28, 1967, at 1. The Coast Guard submitted a Ports and Waterways Safety Act proposal to Congress on May 27, 1970 focusing on the safety hazards substances like oil spilled in waters or harbors. Created by H.R. Rep. 563, 92d Cong., 2d Sess., at 4 (1971).

[315] 86 Stat. 424. (codified at 33 U.S.C. §1221-1236 (1988).

[316] S. Rep. 724, 92d Cong., 2d Sess., at 13 (1972).

[317] Carr, supra note 166, at 293-296.

[318] See Hearings before the Committee on Commerce on Recent Tanker Accidents, p 201. U.S. Congress, Senate, Committee on Commerce, Recent Tanker Accidents: Hearings on Ports and Waterways Act Before Senate Committee on Commerce,95th Cong., 1st Sess. (1977).

requirements.[319]

In 1976, the Secretary of Transportation transferred the marine pollution problem from commerce experts to a newly task force charged to review marine safety regulations and oil spill prevention regulations.[320] As a result of the task force's study, President Carter announced new minimum construction and equipment standards for tankers, requiring segregated ballast, and inert gas systems to minimize accidental explosions.[321] The Port and Tanker Safety Act of 1978 grew from these efforts to address marine pollution and safety hazards arising from oil and other hazardous substances.[322] The Act gave the Coast Guard stronger vessel traffic control, mandated federally licensed pilots for vessel pilots not otherwise licensed in one of the states, and required crew members be certified to handle oil and hazardous substances transported by ship.[323] The PWSA establishes manning levels to insure safe vessel navigation.[324] Enforcement measures of the PWSA include civil and criminal penalties. Civil penalties may impose a maximum of $25,000 for each violation against any person who

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[319] Id.

[320] Evans, supra note 313.

[321] Id. at 48.

[322] Id.

[323] Id. at 48-50.

[324] 33 U.S.C. at §1228(a).

violated the act's provisions.[325] Criminal penalties may be imposed for willful violations. Originally maximum penalties were set at $50,000 or five years imprisonment or both.[326] The Oil Pollution Act (OPA) discussed below repealed that section, making willful violations a class D felony and increasing the maximum penalties.[327]

B. Liability and Compensation Laws

The United States developed a patchwork of liability and compensation laws to attempt oil spill control. The United States was a signatory to the 1969 CLC, and Fund Conventions discussed earlier, but the U.S. never ratified them claiming the liability limits were unacceptably low.[328] Congress started the quilt of marine oil spill legislation with the Water Quality Improvement Act of 1970.[329] This act imposed strict liability on tanker owners for oil spill clean up costs occurring within U.S.

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[325] Id. at §1232.

[326] Id. at §1232(b).

[327] 33 U.S.C. § 1232 (Supp. 1991).

[328] Beth Van Hanswyk, The 1984 Protocols to the International Convention on Civil Liability for Oil Pollution Damages and the International Fund for Compensation for Oil Pollution Damages: An Option for Needed Reform in United States Law, 22 International Lawyer, 319, 326, 1988.

[329] Pub. L. No. 91-224, 84 Stat. 91 (1970) (codified in scattered sections of 33 U.S.C.) (superseded in 1972)

waters.[330] Responsible owners or operators were required to reimburse the federal government for clean up costs up to a maximum liability of $14 million, in amount of $100 per gross registered ton of the ship.[331] This act provided no mechanism for third-party damages, nor did it impose preventative measures.[332] Those held responsible under the act could avoid liability only by establishing one of four limited defenses.[333]

The Federal Water Pollution Control Act Amendments of 1972 amended the 1970 act by making the oil spill provisions applicable to hazardous substances as well.[334] The liability and compensation provisions were otherwise not changed. The Clean Water Act of 1977 (CWA) further amended the prior acts.[335] Liability limits were increased to $150 per gross registered ton and the $14 million liability

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[330] 84 Stat. at 94, 97 (1970) (current version at 33 U.S.C. 1321(f)(1982)

[331] Id.

[332] Van Hanswyk, supra note 328, at 327.

[333] If the spill were an act of God, an act of war, negligence on the part of the U.S., or resulting from the act or omission of a third party, the responsible owner or operator will avoid liability. 84 Stat. at 94 (1970) (current version at 33 U.S.C. § 1321(f) (1982)).

[334] Pub. L. No. 92-500, 86 Stat.816 (1972) (codified at 33 U.S.C. 1251-1376 (1982).

[335] Pub.L. No 95-217, 91 Stat.1566 (1977) (codified as amended at 33 U.S.C. §§ 1251-1376 (1982)).

cap disappeared.[336]

The resulting Clean Water Act still provided private parties with no remedy for oil spill damages, and failed to impose any preventative measures.[337] The CWA further added complexity to U.S. marine pollution laws by permitting states to develop their own oil pollution liability and compensation laws.[338] Three other federal statutes focused on oil spill and pollution from a site-specific approach. The Trans-Alaska Pipeline Authorization Act (TAPPA) covers damages caused by vessels operating between U.S. ports and the Alaskan pipeline.[339] The Deepwater Port Act (DPA) governs deepwater ports developed within the U.S. territorial sea.[340] The Outer Continental Shelf Lands Act Amendments Of 1978 (OCSLA) apply to owners and operators of offshore facilities that produce petroleum from the Outer Continental Shelf and ships operating in adjacent waters which carry oil from the facilities.[341] None of these statutes preempts states from establishing their own

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[336] Id.

[337] Id.

[338] Id. at §1321(o)(2) (1982).

[339] Pub. L. No. 93-153, 87 Stat. 584 (1973) (codified at 43 U.S.C. 1651-1655 (1976)).

[340] Pub. L. No. 93-627, 88 Stat. 2126 (1975) (codified at 33 U.S.C. 1501-1524 (1976)).

[341] Pub. L. No. 95-372, 92 Stat. 629 (1978) (codified at 43 U.S.C. §§ 1801-1866 (Supp II 1978)).

compensation laws.[342] Each act establishes its own liability and compensation system peculiar to its jurisdiction, but none establish preventative measures.[343]

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[342] Outer Continental Shelf Lands Act (OCSLA), 43 U.S.C. § 1820(c) (Supp II 1978); Deepwater Port Act (DPA), 33 U.S.C. § 1517(k)(1); Trans-Alaska Pipeline Authorization Act (TAPPA), 43 U.S.C. §§ 1651-1655 (1976).

[343] The DPA imposes civil penalties of not greater than $10,000 per violation. Unless a violator can prove he is not liable through enumerated defenses, the violator faces joint and several liability for up to $20 million of clean up costs and damages. The defenses include act of war, negligence of the federal government in maintaining and establishing navigation aids, or negligence by the claimant. Unlimited clean up costs and damages may be assessed if the spill results from gross negligence of willful misconduct within the privity and knowledge of the owner/operator. 33 U.S.C. §1517(d) (1975).

TAPPA establishes strict liability for damages from a oil spill of the pipeline holder unless the holder proves the same defenses applicable under DPA. The liability cap is $100 million for any one incident for the owner/operator of the vessel involved. The owner/operator must pay the first $14 million of allowable claims, leaving the remainder to be paid by the Trans-Alaska Pipeline Fund. The fund is collected from the owner of the oil- five cents per barrel is collected at the time it is loaded on the vessel. Monies in the fund cannot exceed $100 million. 43 U.S.C. §1653(c)(5) (1973).

OCSLA imposes joint, several and strict liability for removal costs and damages, including injury, destruction, or loss of use of real or personal property and natural resources, lost profits and tax revenues. The liability cap is $250,000 or $300 per gross ton, whichever is greater, for vessels. 43 U.S.C. §§ 1813-14 (1978), repealed by Oil Pollution Act of 1990, Pub. L. No. 101-380, Title II § 2004, 104 Stat. 484, 507 (1990). An Offshore Oil Pollution Compensation Fund established under OCSLA is available to pay for removal costs not exceeding $200 million. The monies for this fund are generated by a three cents per barrel fee on oil obtained from the Outer Continental Shelf, payable by the owner of the oil. 43 U.S.C. §1812(d)(1), repealed by Oil Pollution Act of 1990, Pub. L. No. 101-380, Title II § 2004, 104 Stat. 484, 507 (1990), §507 codified at 43 U.S.C. §1811.

The 1974 Intervention on the High Seas Act (IHSA) empowers the Coast Guard to take whatever measures on the high seas are necessary to prevent, mitigate or eliminate the imminent or actual danger of damage to the U.S. or its coastline.[344] The Coast Guard must consider threats or damages to human health, marine resources, fish, shellfish, wildlife, estuary and coastal zone activities, and recreational and aesthetic concerns.[345] While this act invests the Coast Guard with intervention powers on the high seas, it does not establish liability or prevention measures.[346] Violators face a maximum penalties of a $10,000 fine or one year in prison or both.[347]

Two fairly old acts were resurrected in this myriad of oil spill legislation to impose liability and compensation. The Rivers and Harbors Act of 1899,[348] and the Shipowner's Limitation of Liability Act of 1851[349] found new life this century. The River and Harbors Act

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[344] Pub. L.93-248, §§ 2-18, 88 Stat. 8 (1974)(codified at 33 U.S.C. §§1471-1487 (1988))

[345] Id. at §1473(b).

[346] Carr, supra note 166, at 284-285.

[347] 33 U.S.C. §1481 (1986).

[348] Ch. 425, 30 Stat. 1148, 1150-1155 (1899) (codified at 33 U.S.C. §§401 et seq (1988)).

[349] Ch. 43, 9 Stat. 635 (1851) (codified at 46 U.S.C. app §§181-189 (1988)).

incorporates the Refuse Act of 1899[350] which prohibits throwing, discharging, or depositing from any vessel refuse matter of any kind.[351] Courts interpret "refuse" to include oil.[352] Violations of the Refuse Act may result in a maximum fine of $2,500 or imprisonment for 30 days or both.[353] No civil liabilities, or mandatory prevention measures spring from the River and Harbor's Act.

The Shipowner's Limitation of Liability Act comes from the era when the United States attempted to encourage entrepreneurs to develop the national shipping industry.[354] The statute permits the shipowner's liability to be limited to the value of his vessel and its pending freight after the marine incident.[355] The judicial trend interpreting this often raised defense by shipowners denies them the right to limit their

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[350] Ch. 425, 30 Stat. 1152 (1899) (codified at 33 U.S.C. §407 (1988)).

[351] The law also applies to one who causes, suffers or procures to be thrown, discharged, or deposited from any vessel or floating craft refuse of any kind. Id. at §407.

[352] U.S. v. Standard Oil Co., 384 U.S. 224, 229-230 (1966).

[353] Carr, supra note 166, at 286.

[354] Id. at 271.

[355] Ch. 43, 9 Stat. 635 (1851) (codified at 46 U.S.C. app. 181-189 (1988)).

liability.[356] Many federal oil pollution statutes preclude this old statute's applicability for damages, however, the shipowner may seek its protection against third party claims.[357] Clearly, Congress cared little about marine pollution prevention measures in 1841, so none appear within this act.

C. Pollution Prevention Laws

The United States eventually developed marine laws designed specifically to prevent oil pollution by mandating certain construction and preventative measures. MARPOL 73 presented the United States with one possible approach of preventative law - the United States, along with most other nations, declined to ratify it . With MARPOL 73/78, the United States found a regime it could support and ratified MARPOL 73/78 on July 2, 1980. The same year Congress enacted implementing legislation, the Act to Prevent Pollution from Ships (APPS).[358] APPS applies to ships registered in the United States and foreign states. The

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[356] Rosenthal & Raper, Amoco Cadiz and Limitation of Liability for Oil Spill Pollution: Domestic and International Solutions, 5 Va. J. Nat. Resource Law, 250, 266-272 (1985).

[357] See Ray v. Atlantic Richfield Co., 435 U.S. 151 (1978)

[358] Act to Prevent Pollution from Ships, Pub. L. 96-478, 94 Stat. 2297 (1980), 33 U.S.C. app. §1902(a)(1) (1988).

APPS exceeds MARPOL 73/78 requirements in some regards.[359] APPS places responsibility on the Coast Guard to ensure vessel compliance with MARPOL 73/78 within U.S. waters.[360]

The Coast Guard may board and inspect vessels within its jurisdiction for conformance with APPS. Failure of vessels subject to APPS to comply with certification requirements may cause the vessel to be detained.[361] Those who violate APPS face civil penalties not exceeding $25,000 per violation.[362] Knowing violations of the act expose violators to criminal prosecution with maximum fines of $50,000 or five years imprisonment or both.[363]

The disastrous Exxon Valdez spill proved these measures to be ineffective. The Exxon Valdez, a three-year-old, "state-of-the-art" vessel, grounded near the pristine waters of Prince William Sound in Alaska, spilling over eleven million gallons of crude oil.[364] Experts found the Exxon Valdez spill would have been reduced by 25 to 60 percent of

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[359] For example, crude tankers between 20,000 and 40,000 dwt must have SBT or COW by 1986, or by reaching 15 years of age, whichever occurred later. MARPOL 73/78 does note require this. Tanker Spills, supra note 9, at 53.

[360] Act to Prevent Pollution from Ships, supra note 358, at §1902(c).

[361] Id. at §1904(c).

[362] Id. at §1980(b).

[363] Id. at §1908(a).

[364] Report to Congress, supra note 10, at 1.

its volume if it had a double hull.[365] Congress took this assessment to heart when it debated over how to prevent spills in the future. Congress focused on prevention measures along with liability schemes in an attempt to end the piecemeal approach to spills.[366]

V. Oil Pollution Act of 1990

The Oil Pollution Act of 1990 made its way into law after decades of political debates stalled comprehensive marine oil spill legislation.[367] The OPA's provisions attempt a holistic approach to oil spills. It contains liability, compensation and preventative measures that reflect more stringent requirements and tools designed to protect the oceans than had been promulgated anywhere in the world. A review of this progressive statute, its implementation, and apparent shortcomings follows.

A. Liability and Compensation Provisions

The OPA began its holistic approach by expanding the reach of its legislation over potential responsible parties. The OPA holds responsible parties of a vessel or facility liable for any discharge of oil or substantial threat of

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[365] Safety at Bay, supra note 86, at 14.

[366] N.Y. Times, Mar. 25, 1989, at A1 col. 2.

[367] Oil Pollution Act of 1990, Pub. L. No. 101-380, 104 Stat. 484 (1990).

discharge into or upon U.S. navigable waters, adjoining shorelines, or the EEZ.[368] Responsible parties include owners/operators of a vessel, land-based, or offshore facilities, the licensee of deepwater ports, the owner/operator of a pipeline, and all responsible parties of abandoned vessels or facilities.[369] Third parties face liability, too, if the responsible parties can show the discharge or threat of discharge, removal cost and/or damages were caused solely by the act or omission of the third party.[370] Responsible parties are held strictly, jointly and severally liable under the OPA.[371]

Responsible parties will be liable for removal costs incurred by the U.S., a state, Indian tribe, or any other person if such removal efforts were consistent with the National Contingency Plan.[372] The recoverable damages expanded with the OPA, too. Six categories of damages may be recovered: natural resources damages;[373] damages for

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[368] Id. at §1001(7), 104 Stat. 484, 486; and § 1002(a), 104 Stat. 484, 489.

[369] Id. at §§1001(32)(B)(C)(D)(E)(F), 33 U.S.C.A. §§ 2701(32)(B)(C)(D)(E)(F).

[370] Id. at §1002(d)(1)(A), 33 U.S.C.A. § 2702(d)(1)(A).

[371] H.R. Conf. Rep. No. 653, 101st Cong., 2d Sess. 102, 103, reprinted in 1990 U.S.C.C.A.N. 722, 781.

[372] Id. at §1002(b)(1)(B), 33 U.S.C.A. § 2702(b)(1)(B).

[373] Only trustees of the U.S., state, or Indian tribes may recover natural resource damages. Id. at §§1002(b)(2)(A), 1006(a), 33 U.S.C.A. §§ 2702(b)(2)(A), 2706(a).

injury to, or economic losses resulting from the destruction of real or personal property;[374] damages for loss of subsistence use of natural resources;[375] damages for net loss of taxes, rents, fees, or net profits due to the injury or loss of real or personal property or natural resources;[376] damages for lost profits or impaired earning capacity due to injury or loss of real or personal property, or natural resources;[377] and damages for the net cost increase in public services provided during or after removal efforts.[378]

Defenses under the OPA are similar to prior spill laws. If the discharge or threat of discharge was caused solely by an act of God or war, or an act or omission of a third party, the responsible party may assert that as a defense.[379] The defenses are not available, however, if

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[374] Id. at §1002(b)(2)(B), 33 U.S.C.A. § 2702(b)(2)(B).

[375] Id. at §1002(b)(2)(C), 33 U.S.C.A. § 2702(b)(2)(C).

[376] OPA requires the National Oceanic and Atmospheric Administration (NOAA) to develop regulations for the assessment of natural resource damages by August 18, 1992. Id. at §1002(b)(2)(D), 33 U.S.C.A. § 2702(b)(2)(D).

[377] Id. at §1002(b)(2)(E), 33 U.S.C.A. § 2702(b)(2)(E).

[378] OPA, at §§1002(b)(2)(A)-(F), 33 U.S.C.A. §§ 2702(b)(2)(A)-(F). Only federal and state governments can recover for loss of taxes, royalties, rents or net profits due to loss or injury of property or natural resources. Local or state governments may recover for the increased costs of public services during or after the removal activities. Id.

[379] OPA, at §§1003(a)(1)(2)(3), 33 U.S.C.A. §§ 2703(a)(1)(2)(3).

the responsible party fails to cooperate with officials on removal efforts, fails to report the spill, or fails to comply with any applicable orders issued.[380]

Limits of liability created under OPA far exceed prior limits under the FWPCA.[381] A tanker greater than 3,000 gross ton is liable for removal costs per incident not exceeding the greater of $1,200 per gross ton, or a total of $10 million.[382] Vessels smaller than 3,000 gross ton face maximum removal costs of $2 million or $1,200 per ton, whichever is greater.[383] The liability limits will not apply if the responsible party caused the incident through gross negligence or willful misconduct or violation of an applicable federal safety, construction or operating regulation.[384] Failure to report the oil spill as the law requires, to reasonably cooperate and assist with removal activities, or to comply with orders given regarding removal

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[380] Id. at §1003(c), 33 U.S.C.A. § 2703(c).

[381] Compare the figures that follow with the FWPCA's cap on clean up costs - $125 per gross ton for inland oil barges, or $125,000 whichever is greater, and $150 per gross ton for oil tankers, or $250,000, whichever is greater. 33 U.S.C.A. §1321(f)(1)(D)(1982). See also Michael P. Donaldson, The Oil Pollution Act of 1990: Reaction and Response, 3 Vill. Envtl. L.J. 283, 288 (1992).

[382] OPA at § 1004(a)(1), 33 U.S.C.A. § 2704(a)(1).

[383] Id.

[384] Id. at §1004(c)(1), 33 U.S.C.A. § 2704(c)(1). The regulation or standard violation of which can prevent the help of liability limits must not be trivial or unrelated to oil discharge. S. Rep. No. 94, at 14, 101st Cong., 2d Sess. 2, reprinted in 1990 U.S.C.C.A.N., 722, 723.

actions will also prevent a responsible party from asserting the liability limits.[385]

The OPA ends a long debate over federal preemption of state law. It permits states to develop additional liability or regulation statutes.[386] The states may develop oil spill funds and require anyone to contribute to the fund.[387] This situation may cause inconsistent legal and regulatory headaches for responsible parties.

The OPA creates financial responsibility requirements for vessels over 300 gross tons at any location subject to U.S. jurisdiction, and those vessels carrying oil destined for the U.S. that operate in the EEZ of the United States.[388] Owners or operators of any applicable vessel must establish and maintain evidence of financial responsibility to meet the maximum amount of liability under OPA.[389] Should a vessel not comply with the financial responsibility requirements, the United States may withhold clearance of the vessel, deny entry or detail the vessel, or seize the vessel as the property of the United States.[390]

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[385] OPA at §1004(c)(2), 33 U.S.C.A. § 2704(c)(2).

[386] Id. at §1018(c), 104 Stat. 484, 506.

[387] Id. at §1018(b)(2), 33 U.S.C.A. § 2718(b)(2).

[388] Id. at §1016(a)(1)-(2), 33 U.S.C.A. § 2716(a)(1)-(2).

[389] Id. at §1016, 104 Stat. 484, 502.

[390] Id. at §§1016(b)(1)(2)(3), 33 U.S.C.A. § 2716(b)(1)(2)(3).

Guarantors providing the financial responsibility may be directly sued by claimants under OPA for removal costs and damages.[391] The guarantor may assert any defenses available to the responsible parties, as well as any insurance policy defenses, or the defense that the responsible parties' willful misconduct caused the incident.[392] The guarantor will not be liable for removal costs or damages that exceed the certificate of responsibility.[393]

B. Preventive Measures

The OPA does not rely solely on liability and compensation measures to "fix" marine oil spills. Congress recognized oil spill prevention is multifaceted and complex. "Solutions are necessarily aimed at different fronts--structural integrity, crew competence, operational procedures, maintenance, navigational controls, technology, and financial responsibility."[394] Congress focused first on the uncoordinated and ill-planned response to spills.

The federal, state governments' and private responses

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[391] Id. at §1016(f), 33 U.S.C.A. § 2716(f).

[392] Id.

[393] Id. at §1016(g), 33 U.S.C.A. § 2716(g).

[394] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

to the Exxon Valdez highlighted the vast need for coordinated oil spill response plans.[395] The OPA requires the preexisting National Oil and Hazardous Substances Pollution Contingency Plan (NCP) be amended to comply with its planning requirements.[396] The OPA's NCP provides more detailed and explicit organized response measures when a spill occurs.[397] A fish and wildlife response plan and standards for removing, mitigating and preventing "worst case discharges of oil" must be included in the revised NCP.[398] A national response unit, Coast Guard strike teams and district response groups, area committees, area contingency plans and vessel and facility response plans comprise the OPA's response system.

The vessel and facility response plans require vessel and facility owners or operators to insure enough private personnel and equipment is available to remove, as best as can be done, a worst case discharge or to prevent or mitigate the threat of such a discharge.[399] Owners or

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[395] Safety at Bay, supra note 86, at 44-55.

[396] The CWA, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C.A. 9601 et seq, developed the NCP. CWA § 311, 33 U.S.C. 1321 (1992); CERCLA § 105, 42 U.S.C. § 9605 (1992).

[397] OPA, Pub. L. No. 101-380, §§ 2002, 2003, 2004, 104 Stat. 484, 507 (1990)

[398] OPA, Pub. L. No. 101-380 §§ 2002, 4201(b).

[399] OPA, Pub. L. No. 101-380, § 4201(a), adding a new subsection to 311(j)(5)(C) of the CWA, codified at 33 U.S.C. § 1321(j)(5)(C).

operators must not only develop the plans for such capabilities, but must contract for those services.[400] The Coast Guard developed guidance for owners and operators to follow when developing and contracting for the response plans.[401] In order to comply with the OPA, owners or operators must obtain Coast Guard inspection and approval of the private plans.[402]

Congress next turned its attention to the "human factor" which comprises the greatest cause of oil spills.[403] The OPA places licensing and certification restrictions on merchant mariners.[404] The Secretary of Transportation may not issue a license or certificate of registry or merchant mariner's document unless the person makes available information regarding his motor vehicle driving record. This requirement is to ferret out those who may have had traffic violations involving drug or alcohol abuse or reckless driving, that potentially pose a safety threat to marine transportation.[405] The Secretary may require the applicant be tested for the presence of

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[400] Id.

[401] Safety at Bay, supra note 86, at 44-55.

[402] Id.

[403] Id.

[404] OPA, Pub. L. No. 101-380, §§4101(a), (g), 104 Stat. 484, 509 (1990).

[405] Id.

controlled substances.[406]

Congress supplements operator licensing requirements with navigational aids - tug escorts for tankers in difficult waters, and vessel traffic services. Tugs can assist tankers with difficult navigation and maneuvering. Currently, tug escorts are required only in Price William Sound and Puget Sound.[407] The OPA charges the Coast Guard with the responsibility of designating other environmentally sensitive areas or navigational hazards that need tug escorts.[408] Vessel traffic service (VTS) systems also provide valuable navigational aids. VTS systems monitor ship traffic, alert them to potential hazards, and control traffic when necessary to avoid accidents.[409] The OPA requires a study be undertaken to identify the ports that would benefit from a new or expanded VTS.

The OPA recognizes the value of avoidance methods to reduce spill impact. Tanker free zones were recognized as sound prevention tactics. These zones prohibit or restrict tanker traffic from environmentally sensitive areas.[410] The OPA did not establish any tanker-free zones, but did

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[406] Cynthia Carney Johnson, The Oil Pollution Act of 1990: A Long Time Coming, 2 Fordham Envtl. L. Rep. 59, 64 (1990).

[407] Safety at Bay, supra note 86.

[408] Id.

[409] Safety at Bay, supra note 86, at 3.

[410] Id. at 6.

direct the Coast Guard to study and designate such zones.[411]

The most controversial and expensive OPA provisions center around improved tanker design and construction requirements.[412] Congress recognized that clean up measures typically only recover 10 to 15 percent of spilled oil.[413] The low recovery rate indicates that spill prevention is the most effective protection of the oceans. Congress viewed the double-hull tanker design as providing the most effective proven method of preventing oil spillage after a ship grounds or collides.[414] Thus Congress directed all tankers traveling within U.S. water to have double hull construction by the year 2015.[415] Both domestic and foreign flagged ships must meet the double hull

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[411] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[412] OPA, Pub. L. No. 101-380, §4115, 104 Stat. 484, 517-522 (1990).

[413] Safety at Bay, supra note 86, at 14.

[414] Id. Collisions or groundings that penetrate the outer hull only will not cause an oil spill. If the inner hull is penetrated as well, oil spillage will be slowed since escaping oil will be contained in the space between the hulls. The amount of protection provided by the hulls is related directly to the space between the hulls. Safety at Bay, supra note 86, at 14-15.

[415] Tanker Spills, supra note 9. Double hulled vessels have both double sides and bottoms. The space in between hulls remains empty or is filled with water to provide ballast (balance) for the vessel. OPA, Pub. L. No. 101-380, § 4115, 46 U.S.C.A. §§ 1274(a), 3703a, 3715(a) (1990).

requirements within the designated timelines.[416] All new tankers contracted for after 1990 must be double hulled. Existing tankers face interim controls until all single hulled tankers are phased out in 2015. Since 80 to 90 percent of U.S. oil spills occurred as a result of tanker groundings, Congress' choice of double-hull construction over other possible designs seems well founded.[417]

These mandates come at a time when the tanker industry can ill afford more capital expenditures.[418] Ninety five percent of oil tankers traveling through the United States have single hulls.[419] Seventy nine percent of the world's tankers have a single hull and one-third of the world's fleet pass through U.S. waters annually. Not surprisingly the tanker industry reacted strongly against OPA's double-hull mandate.[420] "Tankers must be kept working to earn

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[416] Tanker Spills, supra note 9. That the requirement applies to all vessels sailing within the U.S. EEZ is not surprising. Eighty percent of the tankers entering U.S. waters are foreign flagged. With the depletion of the current Alaskan oil fields, dependence on foreign produced oil may well increase the number of foreign tankers travelling to the U.S. ports. Therefore, to exclude foreign tankers from the construction requirements would render the pollution prevention method meaningless. Id.

[417] Safety at Bay, supra note 86, at 14-16.

[418] Id. at 2. The tanker industry has been in an economic slump, resulting in reduced crew sizes and use of less steel in the tanker construction.

[419] Id. at 20.

[420] Tanker Spills, supra note 9, at 11-19.

their keep" explained Exxon in a 1986 oil system guidebook.[421] Taking tankers out of commission for either modification or replacement costs money tanker owners will resist spending except when absolutely necessary.[422] The history of the tanker industry demonstrates its slowness to change except when profitable.

Tanker designs worldwide remained relatively unchanged from 1886 to shortly after World War II.[423] Single-skinned tankers ruled the oil shipping business. After World War II world demand for oil burgeoned creating new shipping patterns. Crude oil production far from its market encouraged greater oil flow across the oceans.[424] With the increased demand tankers grew larger to take advantage of the lower transportation costs. Technical advances developed in enlarging tankers fostered new difficulties.[425] Ships were made lighter, more efficient,

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[421] As quoted in Crude Awakening, supra note 9, at 9.

[422] Id.

[423] Tanker Spills, supra note 9, at 38.

[424] Id.

[425] Id. For example, new design techniques often reduced safety allowances for unknown factors to keep the costs down and get maximum hauling capability with minimum drag from the water. While the design is more efficient, there is less structural tolerance for construction or maintenance errors or unusual operational events. Structural weight reductions were made by reducing the number of oil-bearing compartments. This led to a corresponding increase in the size of individual tanker compartments, which means greater amounts of oil would be spilled if the tank were breached. Id. at 49.

but less robust.[426] These lighter and cheaper designs increased concerns over hull corrosion and fatigue.[427] Despite concerns about structural deterioration, tanker owners only replace the old fleet when it is cost effective to do so, or when forced to by law.[428]

Prior to the OPA, laws did not force true pollution prevention design. The United States ratified and implemented MARPOL 73/78, however, MARPOL's efforts at tanker design ironically lead to greater risks of large volume spills.[429] MARPOL 73/78 focused not on double hull construction, but rather on such things as segregated ballast tanks (SBT) located at strategic positions on the vessel, and tank size limitations.[430]

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[426] Id. Large tankers built in the 1950s and 1960s had deck and bottom plate thicknesses of 30-35 mm. These same plates on tankers built later are only 20 mm in thickness. Since unprotected steel wastes due to corrosion at a constant rate, the need for corrosion protection in newer ships is critical. An unprotected 35 mm plate will be reduced to 30 mm after 10 years, a reduction of 14 percent; whereas, a 20 mm plate will be reduced by 20 percent over the same time period. Id. at 80-81.

[427] Id. Hulls are constructed of thinner, lighter steel which over time corrodes and weakens due to sea travel. Hulls are designed with a certain flexibility to withstand the battering of sea waves and winds, but even steel can only bend so much and so often before it weakens and breaks through "fatigue." Id. at 41, 79-81.

[428] Id. at 172-173.

[429] Id. at 49-51.

[430] Id. Segregated ballast tanks (SBT) are required in all tankers over 20,000 dwt built after a specific date in MARPOL 78 and over 70,000 dwt built after a specific date in (continued...)

C. The OPA's Implementation and Problems

While the OPA signifies an tremendous step towards oil spill prevention, critics still point out flaws in the law and its implementation. The greatest debate is over the double hull regulation. OPA's double hull requirement has been implemented by an Interim Final Rule published by the Coast Guard.[431] The Interim Final Rule drew fire from critics for a variety of perceived flaws. Critics say the spacing requirements between the hulls are inadequate to protect against penetration.[432] Further, critics urge the

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[430](...continued)
MARPOL 73. Tankers must carry sufficient ballast when sailing without cargo to ensure proper balance. SBT are clean tanks that are unavailable for cargo, thereby reducing the volume of oil carried per journey. SBTs are arranged in accordance with MARPOL to cover a specified percentage of the side and bottom of the cargo section. In this manner, SBTs are intended to provide protection against spillage in a grounding or collision. Likewise, the tanks size is limited by MARPOL to particular sizes to minimize oil outflow upon accidental spills. Id. at 46-50.

[431] Double Hull Standards for Vessels Carrying Oil in Bulk; Interim Final Rule, 33 CFR Parts 155 and 157; 46 CFR Parts 30 et seq. (1992).

[432] Tanker Spills, supra note 9. The Coast Guard requires the space between the hulls to be related overall to the size of the vessel. How the spacing is distributed between the side and bottom is left to the tanker owner, as long as the space is at least 2 meters both side and bottom for the vessels. NRDC takes issue with this interpretation of OPA's requirements and the Tanker Spills: Prevention by Design report. NRDC argues that allowing the shipowner to distribute the minimum spacing will likely result in tankers built which do not protect against both groundings and collisions. NRDC points to the recommendation in the latter's report that the minimum inter-hull spacing be calculated by dividing the measurements of the tanker's breadth by 15. This would result in greater spacing than the 2 meters implemented for most tankers. Safety at Bay, supra note 86, at 15-16.

Coast Guard to strengthen structural standards and to ensure proper corrosion protection.[433] The Interim Rule only requires double hulls for tanks within the cargo tank area, leaving bunker fuel protected only by a single hull.[434] One study states 20 percent of oil spills in 1988-1989 could have been prevented or reduced by double hulls surrounding bunker fuel tanks.[435] Barges carry significant quantities of oil along the U.S. coastline, and have spilled more oil than tankers. Yet, the inter-hull spacing required of barges by the Interim Rule is only one meter wide.[436]

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[433] This is viewed as a critical failing in the Interim Final Rule, because the Coast Guard's own report and the Tanker Design: Prevention by Design report highlighted the thinner steel with which tankers are made, leading to corrosion and fatigue faster. Safety at Bay, supra note 86, at 16.

[434] Id. Bunker fuel tanks carry the fuel used by the ship itself. Id. at 17.

[435] Id.

[436] Safety at Bay, supra note 86, at 17-18. Nearly all barges fit within the size category which requires the one meter spacing. The minimum spacing is reduced to 24 inches for barges operating inland or on certain limited coastwise routes. The Coast Guard offered no justification for the diminished barge requirements. There is no requirement for barges to use licensed marine pilots despite the large number of spills through narrow and difficult coastline passages. Id. Barges have fewer pollution-resistant design options. They are unmanned and their tugs are usually minimally manned. Since barges are towed and less manuverable, they are prone to groundings and collisions. Physical designs such as double hulls serve as the best method to prevent spills. Steel hulls are weakened by corrosion, thus necessitating frequent inspections and maintenance. Double hull designs greatly increase the surface area subject to corrosion, making thorough inspections more crucial. One meter wide inter-hull spacing is considered inadequate for tankers to permit

(continued...)

The Coast Guard is also responsible for implementing interim rules governing existing single hulled vessels. Such vessels must comply with structural and operational measures that will substantially protect the marine environment to the extent economically and technologically feasible.[437] The OPA required regulations to be developed by August 18, 1991. To date the regulations have not been published in draft or final form.[438] Critics suggest the interim rules should include tug escorts,[439] vehicle traffic service compliance,[440] emergency cargo transfer systems,[441] tank level pressure monitoring devices,[442]

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[436](...continued)
rigorous hull inspections. A minimum spacing of 2 meters was recommended by the NAS in Tanker Spills, supra note 9, at 3-7. Since corrosion problems affect all vessels, why preclude effective double hull inspection of barges through design? The Coast Guard has not yet addressed that question. Safety at Bay, supra note 86, at 17-18.

[437] Id. at 20.

[438] Id.

[439] Id. at 21. Tug escorts can protect against spills by ensuring safe vessel navigation through hazardous areas, and in situations of loss of power or steerage. Id.

[440] Id. Vessel traffic service (VTS) systems track and monitor vessel traffic. Critics suggest VTS regulations should be in effect nationwide, and should require all single hull vessels' compliance with VTS, especially during bad weather and congested traffic. Id.

[441] Id. at 22. Emergency cargo transfer systems would allow oil to be quickly moved from the damaged or threatened tank to an undamaged tank or another vessel. To retrofit a tanker with such a system costs about $1 million. Id.

emergency towing packages,[443] and restrictions against carrying cargo in wing tanks.[444]

Congress recognized the economic burden OPA places on the tanker industry and the paucity of research available to assess, perhaps cheaper, alternative prevention measures. Thus, Congress tasked the Secretary of Transportation to assess other structural and operational tanker requirements that would provide protection equal to or greater than that provided by double hulls.[445] The Coast Guard completed that study in December, 1992, finding no alternative design which provides greater or equal effectiveness against oil

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[442](...continued)
[442] Id. Tank level pressure monitoring devices would warn crew of any oil loss from a tank or when a tank is overloaded. Such warning may permit the crew to minimize or prevent any oil spillage. The cost of installation is about $300,000 to $400,000. Id.

[443] Id. at 22. Emergency towing packages should be outfitted in positions that ensure the tanker can be stabilized from either end in an emergency. The tanker should be required to carry a messenger line to connect with the tow vessel instead of depending on the tow's ability to shoot a line to the tanker in foul weather. The costs of such a package are about $30,000 per tanker. Id.

[444] Id. at 21-22. Wing tanks are located along the part of the bottom and the sides of the tanker. Wing tanks hold 20 to 40 percent of the vessel's cargo. One study determined two-thirds of oil spilled from tanker with hull damage came solely from wing tanks. Critics propose older vessels be prohibited from carrying oil in the wing tanks. Empty wing tanks, they argue, provide a double hull protection and reduce structural failures due to the reduction in oil carried. Id.

[445] OPA, Pub. L. 101-380, §4115(e), 104 Stat. 484, 517-522.

spills.[446] Supporters of the mid-deck design have strongly disputed this finding.[447] A May, 1993 tanker industry study argues the mid-deck design is as effective, if not more so, in some situations than the double-hull.[448] The debate continues, but the OPA has not yet been amended to permit mid-deck designs.

Debates are not limited to tanker designs. The OPA's

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[446] Report to Congress, supra note 10, at i-ii. The Coast Guard commissioned the National Academy of Sciences to conduct a comprehensive review of the various tanker designs, and started an independent development project with Herbert Engineering Corporation using computer modeling to assess five vessel designs' oil outflow. Those designs are the double hull tanker, mid-deck tanker, underpressure system applied to a single skin tanker with protectively located segregated ballast arrangement, the Coulombi Egg Tanker, and the POLMIS tanker. These studies identified the double hull tanker design as unmatched in preventing oil spills due to grounding. Id.

[447] Mitsubishi Heavy Industries & Skaarup Oil Corporation, Tanker Design for Pollution Prevention, (1993). A study completed by Mitsubishi Heavy Industries and Skaarup Oil Corporation urges Congress to reconsider its stance requiring only double-hull designed tankers. The study declared mid-deck tankers are at least as effective in preventing environmental damage as the double-hull. Mid-deck tankers have a horizontal partition halfway up its cargo area. The partition protects oil above it from accidents. Cargo below the mid-deck is protected by natural laws- if the tanker's bottom hull suffers a hole, greater hydrostatic pressure outside the vessel forces the oil in the lower cargo section into the deliberately empty areas above. Id.

[448] Id. The study acknowledged the probability of "zero outflow" of oil in a grounding is better for a double-hull design, but counters that oil outflow in moderate and severe accidents is estimated to be much less for mid-deck tankers than double-hulls. Mid-deck tankers have not yet been produced, used, or tested in actual shipment. These studies and comparisons are based on the computer projections of mid-deck's performance as compared to the history of double-hulls which have been tried and true for years. Id.

provisions on and Coast Guard implementation of pilotage, VTS systems, tug escorts, and tanker-free zones draw considerable criticism.[449] The Natural Resources Defense Council (NRDC) published a study, Safety at Bay, addressing these points. It urges Congress to pass comprehensive legislation to ensure pilots are competent and prepared for the ships and routes they pilot.[450] The Coast Guard indirectly responded to the criticism with a proposal to require federal pilots be used to navigate foreign trade vessels in specified waters, namely, those foreign trade vessels traveling at offshore marine oil terminals or making intra-port transits within certain waters of New York, New Jersey, and Massachusetts.[451] Otherwise, the only efforts to ensure competent pilots sail U.S. waters come from the established certification process.

More criticism of the OPA's implementation focuses on the VTS system study conducted by the Coast Guard. NRDC claims the study is based on faulty assumptions and is too limited.[452] Specifically, NRDC states VTS systems must be expanded and operated more effectively.[453] The Coast

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[449] The most comprehensive critique of these provisions and implementation efforts is embodied in Safety at Bay, supra note 86, and from Hearings, supra note 7.

[450] Safety at Bay, supra note 86, at 6, 24-26.

[451] 58 Fed. Reg. 36914 (no. 130) (1993).

[452] Safety at Bay, supra note 86, at 4, 26-34.

[453] Id. at 27.

Guard counters that a VTS system study is not yet complete, but VTS systems do not necessarily prevent spills where the cause is an engineering failure.[454] The Coast Guard also explains VTS systems have been reactivated in areas, and rulemaking is underway to make VTS participation in these ports mandatory.[455]

Safety at Bay next argues the Coast Guard should establish speed limits for tug escorts, develop port and escort vessel plans for single and double-hulled tankers, and enact tug escort requirements for all U.S. ports with navigational hazards and/or environmentally sensitive areas.[456] In response to these criticisms, the Coast Guard points out they must balance the large capital and

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[454] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[455] Id. The New York VTS service was reactivated following OPA's passage. New VTS's are opening in New Orleans, Los Angeles/Long Beach, and other critical ports. Id.

[456] OPA requires single-hulled tankers in Prince William Sound and Puget Sound to be escorted by at least two towing vessels. Double-hulls are exempt from this requirement. OPA further requires the Coast Guard to designate other areas requiring escort tugs. The Coast Guard published draft tug escort rules for only the two areas identified in OPA. No other coastal areas were designated for tug escorts. Tug speed limits were not established in that rule either, despite some evidence that supports speed limits to effectively and safely escort tankers. Port plans are not required by the draft rule. Such plans would ensure appropriate vessels and equipment are available and used as necessary. Finally, other potentially environmentally sensitive ports or those with navigational hazards have not been identified leaving these ports open to avoidable spill hazards. See Safety at Bay, supra note 86, at 35-37.

operational expenditures against the benefits provided by expanded use of tug escorts.[457] The Coast Guard is balancing these interests in a pending rulemaking.[458] The Coast Guard did not address NRDC's claims that speed limits, port vessel plans, and tug escorts double-hulled tankers are needed.

NRDC highlights the OPA's failure to identify tanker-free zones as a another flaw in the act.[459] The Coast Guard must study tanker-free zones as a possible method to ensure safe navigation, but tanker-free zones are not mandated by law.[460] The study is not yet complete or implemented, leaving a potential gap in oil spill prevention.[461] The Coast Guard responds it is working quickly to complete the study of tanker-free zones feasibility, but such study will not be delivered to Congress until 1995.[462]

Implementation of the OPA has been very slow. As of January 28, 1993, only 3 percent of vessels subject to the OPA delivered their Vessel Response Plans. The due date for

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[457] Id.

[458] Notice of Proposed Rulemaking, 57 FR 30,058 (July 7, 1992).

[459] Safety at Bay, supra note 86, at 38-39.

[460] Id.

[461] Id.

[462] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

VRPs is statutorily set for February 18, 1993.[463] Implementing the financial responsibility requirements of the OPA has been similarly slow and difficult, because the OPA vastly increases the amounts vessels must demonstrate.[464] The world tanker community states it is not prepared to meet these requirements. In reply to these concerns, the Coast Guard prepared a Preliminary Regulatory Impact Analysis (RIA).[465] It considers four options: retention of the existing rules;[466] adoption of the Notice of Proposed Rulemaking (NPRM) of September 26, 1991;[467] amendment of the NPRM's self-insurance formula by eliminating the working capital requirement and/or the requirement to maintain assets within the U.S.; or amend the NPRM to accept entry into a Protection and Indemnity

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[463] Lloyd's List, Jan. 28, 1993, at 1.

[464] In some instances, the amount of financial responsibility required under OPA is seven times greater than the international liability regime. Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[465] 58 Fed. Reg. 38,993 (1993).

[466] The existing rules require vessel owner to demonstrate they have insurance coverage or assets adequate to meet the liability limits. OPA sets the liability limits to be the greater of $1,200 per gross ton, or for tankers 3,000 gross tons or less $2 million, or for tankers greater than 3,000 gross tons $10 million. These liability limits are set regardless of fault. Administrative, civil and criminal penalties were significantly increased as well. Since OPA does not preempt states from setting their own liability limits, tanker owners face potentially unlimited liability for oil spills in U.S. waters. Safety at Bay, supra note 86, at 58-61.

[467] 56 Fed. Reg. 49,006 (1991).

Club (P & I Club) as an asset for self-insurance.[468]

The Coast Guard itself pointed out several flaws in the OPA. One minor one is the OPA fails to address propulsion failures.[469] This oversight is not considered significant because between 1981 and 1991 thirty-two tankers suffered propulsion failures, causing six to ground, but none spilled oil.[470] The Coast Guard also highlighted a loophole in oil spill response plans. Foreign flagged tankers in transit through the EEZ need not have a vessel response

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[468] Most tanker owners do not have the assets or funds to meet self insurance requirements given the high cost of oil spill clean-up and damages. P & I Clubs grew from ship owners need to provide coverage where conventional insurance companies were unwilling to risk their funds. These clubs are akin to mutual, nonprofit insurance companies. Clubs do not issue policies, and insureds are referred to as members. Ships are "entered" into the club if the club accepts the particular vessel. The club's obligation to pay arises only after the member has paid the obligation in question. Directors of the club have tremendous discretion whether to pay a claim or not. The chief source of vessel pollution liability protection comes from P & I coverage. Petroleum and tanker trades created TOVALOP and CRISTAL as described infra to help meet oil pollution costs. The industry funded protections are limited to insure the industries economic viability. See Raymond P. Hayden & Sanford E. Balick, Marine Insurance: Varieties, Combinations, and Coverages, 66 Tul. L. Rev. 311 (1991). P & I Clubs state they will refuse to act as insurers under OPA, because they face unlimited damages. P & I Clubs are also concerned about OPA's permitting direct action for spill damages and compensation against the insurer. Since P & I Clubs granted direct action guarantees in the 69 countries that are signatories to the CLC and Fund Conventions (which have comparatively low liability limits), the clubs' direct action concerns spring from the unlimited liability they could face. Lloyd's List, supra note 463.

[469] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[470] Id.

plan, unless they had previously been in a U.S. port and had contemplated the transit.[471] This demonstrates how the time-honored doctrine of innocent passage acts to relieve such tankers from the OPA's stringent vessel response plans.

VI. Current Status of International Marine Pollution Law

Despite the OPA's perceived and real flaws, it stands as the first legislative attempt in the world to address oil spills comprehensively. OPA will have a global impact. In recognition of this, the Coast Guard has worked at the international level to establish double hull standards.[472] The U.S. submitted a proposal to the IMO in November, 1990 asking for international standards to require double hulls.[473] The IMO responded to the proposal with a series of meetings and new regulations impacting MARPOL 73/78 oil spill measures.[474] The IMO meetings produced concrete action generally in keeping with the U.S. proposals.

A. New Preventative Measures

The Marine Environmental Protection Committee (MEPC) of IMO considered and basically approved the U.S. proposal for

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[471] Id.

[472] 57 Fed. Reg. 36,222 (August 12, 1992). 33 CFR Parts 155 and 157; 46 CFR parts 30, 32 70, 90, and 172.

[473] 57 Fed. Reg. 36,222 (1992).

[474] Id.

international double-hull standards.[475] MEPC at its 31st session in July, 1991 approved a draft Regulation 13F for circulation to IMO member states for their comments.[476] A MEPC working group refined the regulation and it was formally adopted by MEPC on March 6, 1992.[477] The regulation differs from the OPA in that mid-deck hull designs are permitted as a lawful alternative to double-hulls.[478] MEPC also adopted Regulation 13G to Annex I of MARPOL 73/78. Regulation 13G requires existing single-hulled vessels be retrofitted or retired once the vessel has been in service 30 years.[479]

These amendments to MARPOL 73/78 entered into force July 6, 1993, with a variety of deadlines and requirements.[480] New tankers for which the construction

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[475] Id. at 36,223.

[476] Id.

[477] Id.

[478] Id. Mid-deck design is still theoretical- none have been built and tested. The lack of an operational history to assess, along with some design limitations, kept the United States from accepting it as a viable alternative to the double hull construction. Mid-deck tankers have double sides, but no extra bottom plating to protect against groundings. Its design is more complex than double hulls, thus requiring sophisticated shipboard staff to operate and maintain it. Report to Congress, supra note 10, at 16-16e. Not all studies concluded that mid-deck hulls were ineffective. IMO conducted its own studies and analyzed others. It concluded mid-deck and double hull tankers provided equivalent protections. IMO News, supra note 254, at 1-2.

[479] Id.

[480] Focus on IMO, supra note 160, at 19.

contract is entered after July 6, 1993, or the keels of which are laid after January 6, 1994, or which are delivered after July 6, 1996 must meet Regulation 13F requirements.[481] All existing tankers must comply with Regulation 13F not later than 30 years after their date of delivery.[482] Pre-MARPOL vessels not later than 25 years after the delivery date, must be retrofitted with side or bottom protection covering at least 30% of the cargo tank area.[483] Design and construction methods for new and existing tankers must meet MEPC approval.[484] The amendments also create an enhanced inspection program and emergency plan provisions.[485]

Existing tankers will be subject to more comprehensive inspections during their periodic, intermediate and annual surveys.[486] Tankers five years old and older must carry on board a complete file of survey reports along with an evaluation report endorsed by the flag state.[487] Tankers weighing 150 gross tons and larger must also develop a

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[481] Id.

[482] Id.

[483] Id.

[484] Id.

[485] Id.

[486] IMO News, supra note 254, at 2.

[487] Id.

shipboard oil pollution emergency plan.[488] The plan must detail reporting procedures for any oil spill, the action to be taken when a spill occurs, and how the response to the spill will be coordinated with shipboard, national and local authorities.[489]

The 1991 amendments to MARPOL 73/78 may encourage tanker owners to scrap much of their fleet, since most tankers are between 15 to 20 years old, and it will likely be uneconomic to retrofit them to the new international standards.[490]

VII. Lessons and Conclusions

The Braer spill give the world an unfortunate opportunity to assess its current oil spill prevention regime.

A. Lessons from Braer Spill

The Braer's load of nearly 25 million gallons of Gullfaks crude oil endangered a sensitive ecological area in the Shetland Isles.[491] It seemed to be an environmental disaster waiting to happen. When the oil spilled, the short-term impacts seemed much less than feared. The many

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[488] Id.

[489] Id.

[490] Id. at 22.

[491] NOAA Report, supra note 3, at 1.

variables that determine an oil spill's impact seem to have been the most favorable possible to prevent catastrophic short-term damage. The oil came from Norway and was a light, high-grade crude that showed a tremendous tendency for natural dispersion in the rough seas off Scotland.[492] As discussed above, the composition of the oil spilled greatly affects the spill's impact. The oil dispersed quickly, did not form slicks thicker than sheens.[493] Uncalibrated measurements of water dissolved in the water column found the concentration of dissolved oil to be very low.[494] The hurricane-level weather assisted in dispersing the huge oil spill with little oiling of the shores.[495] However, the paucity of long-term research will hamper assessment of the long-term effects of the Braer spill.

The poor weather also prevented tug escorts from reaching the disabled Braer prior to the spill.[496] With a tug escort, the Braer arguably would not have grounded. Only

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[492] Id. at 3.

[493] Sheens are the least lasting of oil slicks. Id.

[494] A sample taken near the bay struck by Braer's oil measured concentrations of oil in the range of 100 parts per million near the vessel. The concentration levels dropped to the hundreds of parts per billion only 10-15 kilometers north. Id.

[495] Id.; Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[496] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

U.S. law currently addresses tug escorts. Even then, the OPA currently only requires tugs in three geographical areas.[497] While other areas are being considered for mandatory tug escorts, the Coast Guard is weighing the cost of escorts over the need for them.[498]

Other facts about the Braer spill demonstrate loopholes in the prevention laws. The Braer's loss of power is a common event for oil tankers.[499] Neither international nor U.S. law addresses propulsion failures despite their attempts to address spills in a multi-faceted way. The Braer grounded near an area known for its rich marine life, and fragile shorelines. Indeed, a voluntary 10-mile tanker free zone was in effect around the Shetland Isles since 1979.[500] The Shetland Islands Council proposed to the IMO that tankers avoid that vicinity in future passages. IMO indorsed the proposal.[501] Even were the proposal adopted worldwide prior to the Braer spill, it is unlikely to have prevented the spill. The Braer was reportedly navigating well outside this tanker free zone along a common navigational route when it lost power.[502] It drifted into

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[497] Id.

[498] Id.

[499] Id.

[500] Id.

[501] Id.

[502] Id.

the zone due to the gales.[503] The United States is evaluating certain areas within its EEZ for possible tanker free zones.[504] Critics complain the study of the zones is taking too much time, and leaves large sensitive coastlines vulnerable.[505]

Vessel Traffic Services (VTS) were offered near the Braer's grounding, but the Braer was just outside its range and jurisdiction.[506] It is not clear VTS would have helped avoid the spill; it would not have prevented the propulsion failure. Critics argue expanded VTS systems will make a difference in most coastal groundings and collisions, and the delay in expanding them jeopardizes coastline ecosystems.[507]

The Braer was a 17 year old single-hull vessel that was current in all of its required classification inspections.[508] Its grounding fuels the debates over the merits of double-hulls. The Braer split in pieces days after grounding- some say even a double hull would not have

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[503] Id.

[504] Id.

[505] Hearings, supra note 7, (testimony of Nina Sankovitch, NRDC).

[506] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

[507] Hearings, supra note 7, (testimony of Nina Sankovitch, NRDC).

[508] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

prevented the spill.[509] Clearly, tanker designs are not the absolute cure for spills, but total design upgrades would help.

The response of the British government, both national and local, seemed well planned and organized.[510] Press concerns, cleanup crews and measures, removal vessels, and inspections of the grounded tanker were all integrated and smoothly handled. Recovery and cleanup efforts were ready to respond if ther was a break in the storms. The weather eventually prevented recovery efforts, and the oil's nature obviated extensive cleanup measures.[511]

Other preventive measures to consider in the Braer spill are on board response equipment and vessel response plans. On board response equipment would likely have had little benefit in the Braer's case. The weather, winds, and waves prevented any recovery efforts, so on board oil containment booms or skimmers would have been of questionable value.[512] This fact seems to validate the U.S. Coast Guard's position on shipboard equipment requirements- that they are of little value compared to the costs.[513] It is difficult to dismiss the importance

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[509] Id.

[510] NOAA Report, supra note 3, at 2.

[511] Id.

[512] Id.

[513] Id.

planned responses starting with the vessel itself. The Braer did not have a vessel response plan as none has yet been required by international conventions.[514] The United States does require them, but vessel response plans have yet to be submitted and approved by the Coast Guard.[515]

Vessel response plans are slowly being submitted. Their tardy arrival hinders effective coordinated response the unexpected happens.[516] Since tanker operators are first to know of their vessels' potential threat, the lack of an organized plan complete with sufficient manpower and equipment to address unexpected groundings and collisions seems to invite disastrous spills.[517] Currently, crews are so small there may be little they can do. The requirement for vessels to develop a "worst case discharge" plan has been widely criticized as an unreasonable planning standard. Supporters of this viewpoint claim the Braer spill exemplifies the unreasonable planning demands- no one can control or plan to successfully avoid weather conditions.[518]

International and national liability and compensation

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[514] Id.

[515] Hearings, supra note 7, (testimony of Nina Sankovitch, NRDC).

[516] Id.

[517] Id.

[518] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

regimes watch with interest as the Braer's claims roll in. After the Braer's grounding, estimates of the potential liability ran rampant.[519] The short term liability figures are not yet available, nor has there been sufficient study or time to assess the long term liability. International conventions may govern the spill and set significant caps on liability.[520] The OPA, by contrast, establishes liability caps far above the international limits.[521] The OPA also expands the kinds of damages compensated as discussed above. For example, damages for natural resources are not provided in international conventions or private agreements. The OPA broke new ground imposing liability for natural resources damages. What those damages are or how they are calculated remains unknown. The National Oceanic and Atmospheric Administration is required to establish regulations necessary to assess natural resources damages, but has not

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[519] Cleanup costs were estimated to be limited to $83 million under existing international conventions. The oil company that chartered the Braer said it had insurance funds up to $700 million to pay legal claims. The day of the grounding insurers quickly estimated $17 million would be available. Later reports estimated the Braer's liability would likely be only $8 million for cleanup and damages. The Braer Disaster, Fin. Times, Jan. 7, 1993, at 5.

[520] Id.

[521] Hearings, supra note 7, (testimony of Rear Admiral Arthur E. Henn).

issued final regulations yet.[522]

The Shetland Islands Council echoed the thoughts written above and addressed several other lessons learned from the Braer spill. It urges implementation of surveillance systems under local control manned by qualified staff be established under an internationally funded program.[523] The Council encourages states to enforce operation and maintenance standards in accordance with the international conventions.[524] Lastly, it asks that "flags of convenience" states require meaningful, direct links to the state before allowing vessels' registry. The Council believes such direct links between the flag state, the base of the beneficial owner's operation and the crew's nationality would ensure a coherent management structure complete with accountability under international and national laws.[525]

B. Conclusion

Oil spill laws designed to prevent spills like the Braer have evolved slowly, and sometimes with little hope of preventing spills. It took decades for the international

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[522] Hearings, supra note 7, (testimony of Nina Sankovitch, NRDC).

[523] Hearings, supra note 7, (testimony of M.F. Green, Shetland Islands Council).

[524] Id.

[525] Id.

community to develop conventions making the polluters pay for cleanup costs and damages. Even so, the liability limits have been soundly criticized as too limited. It took the international community even longer to realize suing and punishing the polluters fails to protect the oceans, the global commons often viewed as the earth's indestructible dumping ground. Without comprehensive studies of oil spill impacts on the long-term health of the oceans, it is hard to judge whether existing measures are adequate.

Only in the past several years has the world awakened to the need for solid oil pollution prevention measures. Controversies rage over the such measures as double hulls, vessel response plans and equipment, and inspection requirements. Yet some headway has been made. The United States led the way with ground-breaking legislation in these areas, only to be faulted for slow implementation and weak regulations implementing the OPA. The OPA attempts to weave together a holistic approach to prevention including requirements of structural integrity, crew competence, operational procedures, maintenance, navigational controls, technology and financial responsibility. While it leaves some gaps and needs strengthening in places, the OPA stands as the most comprehensive marine oil spill legislation in the world.

IMO and its member states lag behind the U.S. efforts by about two years. Nevertheless, they too have made

progress. IMO has established prevention measures through requirements for either double hull or mid-deck tanker designs, enhanced inspection and survey requirements, and they are considering tanker free zones. While these measures may advance the protection of the oceans, enforcement of prevention measures remains a difficult task.

The high seas remains open for tankers in any condition to transport their oil. "Flags of convenience" states impose weak, if any, environmental controls, on their vessels. By flying the flag of these environmentally irresponsible states, tankers considered to be unserviceable and unfit to safely transport oil sail the seas with relative impunity. International law must address the serious flaw in its enforcement of oil spill laws. One method of fixing the problem is found in the OPA. The OPA extends its control and mandates to all vessels within its jurisdictional reach, but not so with other states' laws.

Coastal states present unique enforcement problems as well. Coastal states have the right to implement national standards to protect their shores. This empowers coastal states to draw more commerce to their ports by minimizing marine pollution laws. Port states face the same temptation. Luckily for the oceans, world consensus evinces a growing concern for the global commons it relies on so much. While the OPA and measures such as double hulls will not prevent oil spills, such comprehensive prevention

measures implemented and effectively enforced are a useful start.